

DOCUMENT RESUME

ED 113 441

CE 004 888

TITLE Career Preparation in Data Processing--Keypunch Operator, Key-To-Tape Operator, Key-To-Disk Operator. An Instructor's Guide.

INSTITUTION New York State Education Dept., Albany. Bureau of Continuing Education Curriculum Development.; New York State Education Dept., Albany. Bureau of Secondary Curriculum Development.

PUB DATE [75]

NOTE 43p.

EDRS PRICE MF-\$0.76 HC-\$1.95 Plus Postage

DESCRIPTORS *Business Education; Curriculum Guides; Data Processing; *Data Processing Occupations; *Electronic Data Processing; Post Secondary Education; Secondary Education; *Teaching Guides; Unit Plan

ABSTRACT

The outline presents six units of instruction for use in secondary schools and adult education programs to help prepare students with basic typewriting skills for employment as data entry operators. The units are: (1) introduction to punched card data processing, (2) nonbuffered card punch machines, (3) punched card verifiers, (4) buffered card punch/verifiers, (5) key-to-tape data recorders, and (6) key-to-disk data recorders. They are designed for use as follows: unit one as an introduction to any of the other units, unit three to follow unit two, and units two, four, five, and six, which do not build on the content of the other units, to be used in any sequence. Objectives for each unit are stated in behavioral terms. A two-column format lists topics necessary for an adequate presentation on the left and teaching methods on the right with textbook page references. A description is provided of instruction time required, facilities, application in secondary and adult education programs, classroom management, general teaching suggestions, and expected outcomes for the entire course. Also included are a three-page glossary and a 30-item bibliography of textbooks, references, films, transparencies, and programmed instructional units. (Author/MS)

* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *

FD113441

AN INSTRUCTOR'S GUIDE

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

CAREER PREPARATION IN DATA PROCESSING

KEYPUNCH OPERATOR
KEY-TO-TAPE OPERATOR
KEY-TO-DISK OPERATOR



CE004888-

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University (with years when terms expire)

1981 Theodore M. Black, A.B., Litt.D., LL.D., Pd.D., Chancellor - - - - -
1987 Carl H. Pforzheimer, Jr., A.B., M.B.A., D.C.S., H.H.D., Vice Chancellor - - - - -
1978 Alexander J. Allan, Jr. LL.D., Litt.D. - - - - -
1980 Joseph T. King, LL.B. - - - - -
1981 Joseph C. Indelicato, M.D. - - - - -
1979 Francis W. McGinley, B.S., J.D., LL.D. - - - - -
1986 Kenneth B. Clark, A.B., M.S., Ph.D., LL.D., L.H.D., D.Sc. - - - - -
1983 Harold E. Newcomb, B.A. - - - - -
1988 Willard A. Genrich, LL.B., L.H.D. - - - - -
1982 Emlyn I. Griffith, A.B., J.D. - - - - -
1977 Genevieve S. Klein, B.S., M.A. - - - - -
1981 William Jovanovich, A.B., LL.D., Litt.D., L.H.D. - - - - -
1976 Mary Alice Kendall, B.S. - - - - -
1984 Jorge L. Batista, B.A., J.D. - - - - -
1982 Louis E. Yavner, LL.B. - - - - -

President of The University and Commissioner of Education

Executive Deputy Commissioner of Education

Deputy Commissioner for Elementary, Secondary, and Continuing Education

Associate Commissioner for Instructional Services

Assistant Commissioner for General Education and Curricular Services

Director, Division of Curriculum Development

Chief, Bureau of Continuing Education Curriculum Development

Assistant Commissioner for Occupational and Continuing Education

Director, Division of Occupational Education Instruction

Chief, Bureau of Business Education

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University (with years when terms expire)

ck, A.B., Litt.D., LL.D., Pd.D., Chancellor	Sands Point
mer, Jr., A.B., M.B.A., D.C.S., H.H.D., Vice Chancellor	Purchase
an, Jr. LL.D., Litt.D.	Troy
LL.B.	Shelter Island
scato, M.D.	Brooklyn
aley, B.S., J.D., LL.D.	Glens Falls
t, A.B., M.S., Ph.D., LL.D., L.H.D., D.Sc.	Hastings on Hudson
mb, B.A.	Owego
ich, LL.B., L.H.D.	Buffalo
th, A.B., J.D.	Rome
ein, B.S., M.A.	Bayside
ich, A.B., LL.D., Litt.D., L.H.D.	Briarcliff Manor
all, B.S.	Irondequoit
a, B.A., J.D.	Bronx
, LL.B.	New York

iversity and Commissioner of Education

Ewald B. Nyquist

missioner of Education

Gordon M. Ambach

for Elementary, Secondary, and Continuing Education

Thomas D. Sheldon

er for Instructional Services

William L. Bitner III

er for General Education and Curricular Services

Vivienne N. Anderson

f Curriculum Development

Gordon E. Van Hooft

tinuing Education Curriculum Development

Herbert Bothamley

er for Occupational and Continuing Education

Robert S. Seckendorf

f Occupational Education Instruction

Robert H. Bielefeld

iness Education

Hobart H. Conover

AN INSTRUCTOR'S GUIDE

**CAREER PREPARATION
IN DATA PROCESSING**

**KEYPUNCH OPERATOR
KEY-TO-TAPE OPERATOR
KEY-TO-DISK OPERATOR**



Foreword

In today's sophisticated business environment, managers are seeking methods to speed up the process of collecting information and feeding it to the electronic computers for processing. Manufacturers of data processing equipment have responded to the needs of business by developing machines that store huge volumes of data and process them at high speeds. The capacities of these large computing systems require the data to be recorded very rapidly with 100 percent accuracy. As a result, the data entry operations field has grown and methods have diversified to keep step with the demands of the industry. The content of this publication may be used in secondary schools and adult education programs to assist in preparing individuals who wish to enter the data entry field or to upgrade personnel already working in the data processing area.

The development of materials designed to train workers for the field of data processing was initiated by Hobart H. Conover, Chief, Bureau of Business Education. Appreciation is expressed to Carl Appey, data processing instructor, Nassau County BOCES, Westbury, for preparing the instructional materials. Assistance relating to content was provided by Ronald W. Wing, associate in the Bureau of Business Education. The project was coordinated and the manuscript prepared for publication by Nelson S. Maurer, associate in the Bureau of Continuing Education Curriculum Development.

HERBERT BOTHAMLEY, *Chief*
Bureau of Continuing Education
Curriculum Development

GORDON E. VAN HOOFT, *Director*
Division of Curriculum Development

Message to the Instructor

Career Preparation in Data Processing is part of a cluster of occupational preparation related to the field of data processing. The principles and practices outlined in this guide are particularly important for persons who wish to enter the field of data entry operations or for individuals who wish to upgrade their present skills. The content builds on a base of elementary understandings and permits the student to apply his knowledge and refine his skills at each step of the educational process. Throughout the various units, the students progress should be evaluated in terms of the specific performance objectives.

The program may also be used as part of the occupational preparation for data processing clerical personnel. Secondary and adult students who are learning about or have experience in data processing can use the basic skills to develop a specialization that will be useful in their career development.

The instructor is urged to use this outline with his students in relation to their stage of development. Individual and small group learning activities should be utilized and improved upon with experience. While we feel that the elements of a successful program are contained in this publication, please let us know where future improvements can be made.

HOBART H. CONOVER, *Chief*
Bureau of Business Education

ROBERT H. BIELEFELD, *Director*
Division of Occupational Education Instruction

Contents

	Page	
Foreword	ii	Unit 1 - Introduction to Punched Data Processing . . .
Message to the Instructor.	iii	Unit 2 - Nonbuffered Card Punch
Introduction	1	Unit 3 - Punched Card Verifiers.
Purposes of Course	1	Unit 4 - Buffered Card Punch/Ver
Course Description	1	Unit 5 - Key-to-Tape Data Record
Time Required.	1	Unit 6 - Key-to-Disk Data Record
Format of Guide.	2	Glossary
Facilities	2	Bibliography
Application in Secondary Schools	2	
Application in Adult Education	2	
Classroom Management	3	
Teaching Suggestions	4	
Expected Outcomes.	4	

Contents

	Page		Page
.....	ii	Unit 1 - Introduction to Punched Card	
uctor.	iii	Data Processing	5
.....	1	Unit 2 - Nonbuffered Card Punch Machines	7
.....	1	Unit 3 - Punched Card Verifiers.	12
.....	1	Unit 4 - Buffered Card Punch/Verifiers	15
.....	2	Unit 5 - Key-to-Tape Data Recorders.	21
.....	2	Unit 6 - Key-to-Disk Data Recorders.	27
ondary Schools	2	Glossary	32
lt Education	2	Bibliography	35
nt	3		
ns	4		
.....	4		

Introduction

The electronic data processing industry affects the lives of many people. The growth of the industry has been phenomenal. In 1970 there were about 40,000 computers in use and it has been estimated that the number will more than double in the next few years.

Lately, manufacturers of data processing equipment have been directing their attention to the small business market. Firms that previously used manual data processing systems can now afford to convert to an economical automated system. Also, larger companies already using electronic computing equipment are adopting direct data entry methods. Thus, the increase in the use of data processing equipment, the development of minicomputers and the adoption of direct entry systems have resulted in an increased demand for qualified operators of card-punch machines and data recorders using magnetic tape and disks.

Purposes of Course

This course is designed to assist in the preparation of individuals for employment as data entry operators. Persons already performing clerical functions can use this course to upgrade their skills in order to gain a more profitable position. Also, people wishing to supplement their income may use this course to gain the skills necessary to obtain part-time employment.

Course Description

Career Preparation in Data Entry is a course designed for use in secondary schools and adult preparation programs to prepare individuals for employment as data entry operators. The units in the course are:

- Unit 1 - Introduction to Punch Card Data Processing
- Unit 2 - Nonbuffered Card Punching
- Unit 3 - Punched Card Verification
- Unit 4 - Buffered Card Punching
- Unit 5 - Key-to-Tape Data Recording
- Unit 6 - Key-to-Disk Data Recording

Unit 1 should be used as an introduction to the content of the succeeding units. Unit 3 should be used after Unit 2. Units 2, 4, 5, and 6 are "stand alone" units and contain the necessary knowledge related to each specific unit. Units 2, 4, 5, and 6 do not build on the content of other units and, therefore, may be used in any sequence desired. Because of the nature of the buffered card punches, key-to-tape and key-to-disk machines, students would understand the material better if they were presented after Unit 1.

Time Required

The content for Unit 1 may be completed in approximately 3 to 4 hours. Any

Introduction

ata processing industry affects
ple. The growth of the industry
In 1970 there were about 40,000
It has been estimated that the
double in the next few years.

urers of data processing equip-
ing their attention to the
Firms that previously used
g systems can now afford to
cal automated system. Also,
ady using electronic computing
g direct data entry methods.
the use of data processing
oment of minicomputers and the
try systems have resulted in an
qualified operators of card-
ta recorders using magnetic

signed to assist in the
uals for employment as data
ons already performing clerical
e course to upgrade their skills
e profitable position. Also,
lement their income may use
e skills necessary to obtain

Course Description

Career Preparation in Data Processing may be used
in secondary schools and adult programs to help
prepare individuals for employment as data entry
operators. The units in the course include:

- Unit 1 - Introduction to Punched Card Data Processing
- Unit 2 - Nonbuffered Card Punch Machines
- Unit 3 - Punched Card Verifiers
- Unit 4 - Buffered Card Punch/Verifiers
- Unit 5 - Key-to-Tape Data Recorders
- Unit 6 - Key-to-Disk Data Recorders

Unit 1 should be used as an introduction for any
of the succeeding units. Unit 3 should be presented
after Unit 2. Units 2, 4, 5, and 6 are "self-
contained" and include the necessary skills and
knowledge related to each specific machine. These
units do not build on the contents contained in
other units and, therefore, may be taught in any
sequence desired. Because of the complex nature of
buffered card punches, key-to-tape, and key-to-disk
machines, students would understand Units 4, 5, and 6
better if they were presented after Units 1 and 2.

Time Required

The content for Unit 1 may be presented in
approximately 3 to 4 hours. Any one of the subsequent

Introduction

units will need 30 to 40 hours of instructional time per machine provided pupils have completed successfully at least a half-year typewriting course. This includes the keyboard skills as well as the operation of the verifier. Verifier operations, however should not be emphasized, because employers give this type of work to their more experienced people and use the newly hired workers as data entry operators.

When the nonbuffered card punch machines are taught first, the students have an easier time adjusting to the more sophisticated buffered card punches, key-to-tape, and key-to-disk devices. This procedure reduces the instructional time for the other machines to approximately 20 hours per device.

Format of Guide

The two-column format is designed to assist in the planning and instructing process. The topics necessary for an adequate presentation are given in the left-hand column. Teaching methods and suggestions for making the presentation more effective are given in the right-hand column. Also, selected references are listed here with the complete citations given in the bibliography under the heading of Textbooks found on page 35.

At the top of each unit are listed the general objectives which are stated in terms of the activities that the student is able to do as a result of the instruction. The standards of achievement should be at least the minimum proficiency necessary for entry employment as data entry operators.

Facilities

There should be one work station for each member of the class. If this is not possible due to economic or physical limitations, two work stations

for every three members should be provided. There should be a group demonstration area. This will be used mainly during the first half of the course. Plan to have at least 100 square feet of space for each work station. This space is needed for storage of supplies and materials.

Application in Secondary Schools

The content of this outline of instruction in courses of Auto and Office Practice when key-entry devices are used in local high schools and area schools. The units selected will depend on the equipment available, the level of proficiency of the students, the employment opportunities, and the needs prevalent in the area.

An area center may offer a key-entry course including the use of key-entry devices including the use of instructional units, but the course should include related content from Office Practice and Automatic Data Processing. Such a study should be submitted to the Curriculum Development for approval.

Units of this course may be offered as Office Practice and Automatic Data Processing when key-entry devices are used in comprehensive high schools. These units may be used as the content for short course or single-period course devoted to the use of key-entry devices. The units selected will depend upon the equipment available and the needs prevalent in the area.

Application in Adult Education

The units of this guide may

40 hours of instructional time pupils have completed successful year typewriting course. This skills as well as the operation of Verifier operations, however, is not recommended, because employers give this more experienced people and use them as data entry operators.

Card punch machines are recommended. Students have an easier time with sophisticated buffered card and key-to-disk devices. This instructional time for the device is approximately 20 hours per device.

The format is designed to assist in the structuring process. The topics are presented in separate units. Teaching methods and materials are listed in the right-hand column. Also, the bibliography is listed here with the complete bibliography under the heading "Bibliography" on page 35.

Each unit are listed the general objectives stated in terms of the student is able to do as a result. The standards of achievement are the minimum proficiency necessary for students as data entry operators.

One work station for each member is not possible due to space limitations, two work stations

for every three members should be considered minimal. There should be a group demonstration area which will be used mainly during the first few sessions of the course. Plan to have at least 36 square feet of space for each work station. Additional space is needed for storage of supplies and teaching materials.

Application in Secondary Schools

The content of this outline is suited for units of instruction in courses of Automatic Data Processing and Office Practice when key-entry devices are taught in local high schools and area occupational centers. The units selected will depend on the equipment available, the level of proficiency to be achieved, the employment opportunities, and job standards prevalent in the area.

An area center may offer a half-year course in key-entry devices including the content of these instructional units, but the course also needs to include related content from Office Practice and/or Automatic Data Processing. Such a proposed course of study should be submitted to the Bureau of Secondary Curriculum Development for approval.

Units of this course may be included in such offerings as Office Practice and Automatic Data Processing when key-entry devices are taught in comprehensive high schools. These units also may be used as the content for short courses of a half-year, single-period course devoted to the operation of key-entry devices. The units selected will depend upon the equipment available and opportunities for employment in the area.

Application in Adult Education

The units of this guide may be used in an adult

education program for a single course or a series of courses. Units 1, 2, and 3 would provide suitable content for a course in keypunch operation for a school equipped with nonbuffered card punch machines and verifiers.

Unit 1, 2, 3, and 4 may be used in schools equipped with nonbuffered, buffered, and verifier card punch machines. These four units require approximately 60 to 80 hours of instruction. Because most adult education courses are from 30 to 40 hours in length, it is recommended that two courses be offered and the adult students be encouraged to follow one course with the other. When only one course is offered, the level of productive speed will be lower because some of the time usually devoted to proficiency development will have to be sacrificed.

When a school does not have enough machines of each type to accommodate the entire class at one time, the various machines will have to be taught concurrently. Because the total instructional time needed for all units is 90 to 120 hours, a series of three combinations should be offered which would provide instruction on all machines at the same time. The suggested course titles under such conditions would be, Key-Entry Device Operation 1, 2, and 3.

When a school has enough machines of the various types for individual use, specialized course for each machine may be offered. If the courses are not offered in series, the following 30 to 40 hour combination are suggested:

Course Title	Units Included
Keypunching 1	1 and 2
Keypunching 2	3 and 4
Key-to-Tape Operation	5
Key-to-Disk Operation	6

Adult education instructors review the revised Office Practice and determine how the course fits into the overall program. Also, Chapter IV, Teaching and Chapter V, Job Instruction Sheet, provide insights relative to the planning and delivery of information to students. Copies of the syllabus may be obtained from the business education.

Classroom Management

In an installation that does not have enough machines of a given type for each student, a buddy system where one student acts as the first student and the second student operates the machine. When the buddy system is used, short time projects are recommended in order to provide observation time to a minimum. Projects are likely to result in little learning for the observer and detract from the learning of the machine operator. Short time spaced repetition projects give the students time to review and digest the material before the next review and provide short rest periods for the students. Students may be started on different projects in a rotation system.

Keyboard drilling is necessary to develop speed and accuracy, however, it is a boring task. To alleviate this, projects should be interspersed with the drilling sessions.

The use of simulators for keyboarding is not recommended except as a means of familiarization. Typing on a simulator is quite different from typing on a keypunch and thus the use of a simulator is mildly effective. A typewriter with a simulator also fails to give the

for a single course or a series of
2, and 3 would provide suitable
e in keypunch operation for a
h nonbuffered card punch machines

and 4 may be used in schools
ffered, buffered, and verifier
. These four units require
80 hours of instruction. Because
n courses are from 30 to 40 hours
commended that two courses be
it students be encouraged to
ith the other. When only one
the level of productive speed
se some of the time usually
ncy development will have to be

does not have enough machines of
date the entire class at one
achines will have to be taught
use the total instructional time
s is 90 to 120 hours, a series of
should be offered which would
on all machines at the same time.
e titles under such conditions
Device Operation 1, 2, and 3.

has enough machines of the
individual use, specialized course
y be offered. If the courses are
es, the following 30 to 40 hour
gested:

Units Included

- 1 and 2
- 3 and 4
- 5
- 6

Adult education instructors from industry should review the revised Office Practices Syllabus to see how the course fits into the overall Office Practice program. Also, Chapter IV, Teaching Methods, and Chapter V, Job Instruction Sheets, might provide some insights relative to the planning and presenting of information to students. Copies of the revised syllabus may be obtained from the supervisor of business education.

Classroom Management

In an installation that does not have sufficient machines of a given type for each student, a buddy system where one student acts as an observer while the second student operates the machine may be used. When the buddy system is used, short instructional projects are recommended in order to keep the observation time to a minimum. Extended idle periods are likely to result in little learning for the observer and detract from the learning process of the machine operator. Short time spans where the two students exchange roles give the observer time to review and digest the material he has covered and provide short rest periods for the operator. Also, students may be started on different machines in a rotation system.

Keyboard drilling is necessary to develop speed and accuracy, however, it can become a tedious, boring task. To alleviate this, "live," work-type projects should be interspersed with the drill sessions.

The use of simulators for keyboard skill development is not recommended except as a possible tool during keyboard familiarization. The touch of the keys on a simulator is quite different from that on a keypunch and thus the use of such a machine is only mildly effective. A typewriter with a keypunch simulator also fails to give the student any feel

Introduction

for the operation of a key-entry device relative to card movement and programing.

Teaching Suggestions

The following points are offered as a means of improving instruction.

- Review each unit well in advance of the class and obtain the instructional materials needed for an effective presentation. Whenever possible use instructional aids to clarify the presentation.
- Use a variety of learning experiences in order to challenge the different levels of student abilities.
- Take all opportunities to provide for individual or small group instruction.
- Keep the instruction flexible enough to permit each student to gain the skills and knowledges required to achieve his specific goals.
- Read trade magazines to keep up to date with new information and developments that are occurring in the field of data processing.

Instructors in adult programs may wish to adapt the teaching-learning conditions to their particular group, but the basic format of teaching principles through student involvement should prevail.

Expected Outcomes

Upon successful completion of this course, graduates can expect to find employment in any of such businesses as commercial and savings banks;

utility companies; airlines and firms; local schools and universities; state, and Federal government agencies; oil and gasoline distribution houses and exchanges; and data processing bureaus.

Students who have acquired a knowledge and average keyboard skill of key-entry device can be easily operate other machines of a similar is no specific speed requirement look for when hiring key-entry device. A wide range of speed is expected because the work varies from using all alphabetic, or mixed data; jobs simple to complex; and source documents formal, well organized presentation handwritten pieces of paper. Employers interested in hiring individuals and use the proper techniques. In complex jobs speed is virtual new jobs where speed counts, they will develop with experience.

key-entry device relative to framing.

nts are offered as a means of

well in advance of the class instructional materials effective presentation. He use instructional aids presentation.

f learning experiences in nge the different levels of es.

unities to provide for small group instruction.

ction flexible enough to dent to gain the skills and ired to achieve his specific

zines to keep up to date with and developments that are field of data processing.

ult programs may wish to adapt conditions to their particular format of teaching principles ement should prevail.

ompletion of this course, o find employment in any of mercial and savings banks;

utility companies; airlines and other transportation firms; local schools and universities; municipal, state, and Federal government agencies; manufacturing firms; oil and gasoline distributors; stock brokerage houses and exchanges; and data processing services bureaus.

Students who have acquired a good working knowledge and average keyboard skills on one type of key-entry device can be easily trained to operate other machines of a similar type. There is no specific speed requirement which employers look for when hiring key-entry device operators. A wide range of speed is expected and accepted because the work varies from using all numeric, all alphabetic, or mixed data; jobs range from simple to complex; and source documents vary from formal, well organized presentations to informal, handwritten pieces of paper. Employers are interested in hiring individuals who are accurate and use the proper techniques. They realize that in complex jobs speed is virtually impossible; in new jobs where speed counts, they know that speed will develop with experience.

INTRODUCTION TO PUNCHED CARD DATA PROCESSING

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Identify and explain the function of the various machines used in punched card accounting
- Explain the unit-record concept
- Identify and explain the physical characteristics of a punched card
- Explain the rules governing the recording of data in numeric, alphabetic, and alphanumeric
- Identify and explain the function of the physical characteristics of magnetic tapes and
- Identify employment opportunities for data entry operators

CONTENT

TEACHING SUGGESTIONS

- | | |
|--|--|
| I. Punched Card Accounting | Explain briefly how firms use the punched card steadily increasing data involved in the operation of businesses. |
| A. Card punches | Identify and explain the functions of the various machines commonly used for punched card accounting. |
| B. Other data recorders:
1. Key-to-tape
2. Key-to-disk | Demonstrate the automated data processing cycle with a realistic application such as a payroll, check clearing, or checking account. Describe the operations that take place at each station in order to give the students an understanding of the functions of the various pieces of equipment. |
| C. Peripheral unit-record machines
1. Interpreter
2. Sorter
3. Reproducer
4. Collator
5. Accounting machine | Use a systems flow chart to reinforce the data processing cycle. (Ref. G, pp. 33-41, 46-67-73)*

Use films and transparencies to assist in presenting these topics. See page 36. |
| D. Computers (with card input) | Compare the processing of punched cards in a computer installation with the processing techniques used in modern computers. (Ref. H, pp. 75-87) |

* Reference citations are shown on page 35.

INTRODUCTION TO PUNCHED CARD DATA PROCESSING

For this unit, the student should be able to:

- explain the function of the various machines used in punched card accounting
- unit-record concept
- explain the physical characteristics of a punched card
- rules governing the recording of data in numeric, alphabetic, and alphanumeric fields
- explain the function of the physical characteristics of magnetic tapes and disk records
- employment opportunities for data entry operators

TEACHING SUGGESTIONS

Accounting

Explain briefly how firms use the punched card in handling the steadily increasing data involved in the operation of their businesses.

Machines

Identify and explain the functions of the various types of machines commonly used for punched card accounting.

Data recorders

Magnetic tape

Magnetic disk

Demonstrate the automated data processing cycle with a simple but realistic application such as a payroll, charge account, or checking account. Describe the operations that are being performed at each station in order to give the students a basic idea of the functions of the various pieces of equipment.

Unit-record

Use a systems flow chart to reinforce the concepts of the automated data processing cycle. (Ref. G, pp. 33-41, 44-48; Ref. H, pp. 52-63, 67-73)*

Interpreter

Reducer

Selector

Sorting machine

Use films and transparencies to assist in presenting the various topics. See page 36.

(with card input)

Compare the processing of punched cards in a unit record installation with the processing techniques used by electronic computers. (Ref. H, pp. 75-87)

are shown on page 35.

Introduction to Punched Card Data Processing

CONTENT

TEACHING SUGGESTIONS

II. Unit-Record Concept

A. The punched card

1. Physical characteristics

- a. Corner cuts
- b. Edges and corners
- c. Stripes and colors
- d. Columns and rows

2. Card design

- a. Fields
- b. Factors to be considered

Discuss the physical characteristics and design of the standard 5081 card and several different types of cards.

Discuss the characteristics and coding system of a punch card when the required data recorders are used. (pp. 51-53; Ref. B, pp. 9-10)

B. Recording of Data

1. Types of fields

- a. Numeric
- b. Alphabetic
- c. Alphanumeric (mixed)

2. Rules for recording data

- a. Left-justification
- b. Right-justification
- c. Left-zero fill

3. Field terminology

- a. High-order column
- b. Low-order column (units)
- c. Ten's, hundred's

Explain how to record data onto cards.

Give a short manual simulation project to reinforce the rules that govern the recording of data. Give students a set of punch cards with rule lines that correspond to the fields on a punch card. Ask students to pencil in data along the lines. This illustrates the techniques of left- and right-justification and left-zero fill. (Ref. F, pp. 122-134)

C. Functions of a punched card

1. Recording (storage)

2. Sorting

3. Calculating

4. Reporting

Explain the various functions of a punched card. Give a sample application previously used to illustrate the various functions of a punched card.

Explain how coding makes the recording and processing more efficient.

Have students start a glossary of data processing terminology that is consistent with the field list throughout the course. See Glossary on page 13.

Card Data Processing

TEACHING SUGGESTIONS

pt
ard
characteristics
r cuts
and corners
es and colors
ns and rows
gn
s
rs to be considered

Discuss the physical characteristics and design of a card by using the standard 5081 card and several different types of predesigned cards.

Discuss the characteristics and coding system of the 96-column punch card when the required data recorders are available. (Ref. A, pp. 51-53; Ref. B, pp. 9-10)

Data
fields
ic
betic
numeric (mixed)
recording data
justification
-justification
zero fill
minology
order column
order column (units)
,hundred's

Explain how to record data onto cards.

Give a short manual simulation project to reinforce the rules that govern the recording of data. Give students blank cards and have them rule lines that correspond to the field in a punched card. Ask students to pencil in data along the 12 edge which illustrates the techniques of left-and right-hand justification and left-zero fill. (Ref. F, pp. 122-134)

a punched card
(storage)

Explain the various functions of a punched card. Refer to the sample application previously used to illustrate each of the functions of a punched card.

ng

Explain how coding makes the recording and processing of data more efficient.

Have students start a glossary of data processing terms using terminology that is consistent with the field. Add items to this list throughout the course. See Glossary on pages 32 to 34.

CONTENT

TEACHING SUGGESTIONS

- | | |
|--|--|
| <p>D. Magnetic tape and disk records</p> <ol style="list-style-type: none"> 1. Physical characteristics <ol style="list-style-type: none"> a. Reflective spots b. Coating c. Header and trailer records d. Tape marks e. Interblock gaps f. Density 2. Record design <ol style="list-style-type: none"> a. Fields b. Factors to be considered <p>E. Employment opportunities</p> <p>F. Desirable characteristics of data entry operators</p> | <p>Discuss the operation of key-to-tape and key-to-disk this time only if these devices are needed to work with an individual machine for units 2 and/or 3.</p> <p>Explain the physical characteristics of magnetic tape (Ref. D, pp. 184, 195-199)</p> <p>Explain the factors that influence the design of magnetic tape such as control fields, sorting consideration, and tape length.</p> <p>Discuss the different types of businesses in which they employ data entry operators. Also, indicate the range and promotional opportunities that are available.</p> <p>Emphasize that accuracy is of prime importance, speed and the attention to detail. Typewriting usually reduces the time needed to learn the operation of these devices.</p> <p><i>If your installation does not have enough magnetic tape for each student, implement a rotation system and give instruction to accommodate the different devices.</i></p> |
|--|--|

— • —

NONBUFFERED CARD PUNCH MACHINES

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Punch numeric and alphabetic data into original cards
- Add data to punched cards

Nonbuffered Card Punch Machines

TEACHING SUGGESTIONS

NT	
c tape and disk records	Discuss the operation of key-to-tape and key-to-disk machines at this time only if these devices are needed to provide each student with an individual machine for units 2 and/or 4.
sical characteristics	
Reflective spots	
Coating	
Header and trailer records	Explain the physical characteristics of magnetic tape and disks. (Ref. D, pp. 184, 195-199)
Tape marks	
Interblock gaps	
Density	Explain the factors that influence the design of tapes and records such as control fields, sorting considerations, and maximum length.
ord design	
Fields	
Factors to be considered	
ent opportunities	Discuss the different types of businesses in the local area that employ data entry operators. Also, indicate the present salary range and promotional opportunities that are available.
le characteristics of	Emphasize that accuracy is of prime importance, followed by speed and the attention to detail. Typewriting proficiency usually reduces the time needed to learn the operation of key-entry devices.
ry operators	
	<i>If your installation does not have enough machines of the required type for each student, implement a rotation system and adjust your instruction to accommodate the different devices.</i>

— • —

UNIT 2

NONBUFFERED CARD PUNCH MACHINES

Of this unit, the student should be able to:

c and alphabetic data into original cards
punched cards

Nonbuffered Card Punch Machines

- Correct error cards
- Design and create a program control card utilizing automatic skipping, automatic duplication and alphabetic field definition
- Use a program card to control the punching of data
- Attain 95% accuracy in a 15-minute timed numeric keypunch project with a minimum speed per hour

CONTENT

TEACHING SUGGESTIONS

- | | |
|--|--|
| I. Functions of a Card Punch | Explain and illustrate each function of a card |
| A. Creating original records | Avoid detailed explanations at this time. Cover operating procedures at a later time. |
| B. Adding data to records | |
| C. Correcting records | Demonstrate card handling techniques such as j |
| D. Duplicating records
(remaking damaged records) | |
| II. Operating Features of a Card Punch Machine | Explain the operating features of nonbuffered |
| A. Main-line switch | If your installation has more than one type of the differences at each step. Do not go into keys and switches at this time. Refer to manuals for information on specific machines. |
| B. Card stations | |
| 1. Hopper | |
| 2. Card bed | Place a student at each machine and have him perform functions as they are explained. |
| a. Punching station | |
| b. Reading station | |
| 3. Stacker — automatic card feed stop | |
| C. Keyboard | Give students an opportunity to operate a card short time. This experience will give them a Select or design exercises and projects that features which were discussed. |
| 1. Numeric keys | |
| 2. Alphabetic keys | |
| 3. Special character keys | |
| 4. Functional control keys | Point out that the normal shift of the keyboard when punching without program control. Show how key must be held down when punching digits. |
| a. Shift keys | |
| b. Release, register, feed | |
| c. Multipunch key | |

Machines

ards

te a program control card utilizing automatic skipping, automatic duplication, and numeric field definition

ard to control the punching of data

racy in a 15-minute timed numeric keypunch project with a minimum speed of 5000 strokes

TEACHING SUGGESTIONS

Card Punch

iginal records

to records

records

records

amaged records)

res of a Card Punch

witch

ns

d
ching station

ding station

— automatic card

op

keys

tic keys

character keys

nal control keys

ft keys

ease, register, feed

tipunch key

Explain and illustrate each function of a card punch machine.

Avoid detailed explanations at this time. Cover the actual operating procedures at a later time.

Demonstrate card handling techniques such as joggling and fanning.

Explain the operating features of nonbuffered card punch machines. If your installation has more than one type of machine, point out the differences at each step. Do not go into detail about all the keys and switches at this time. Refer to manufacturers' reference manuals for information on specific machines.

Place a student at each machine and have him perform the various functions as they are explained.

Give students an opportunity to operate a card punch machine for a short time. This experience will give them a sense of accomplishment. Select or design exercises and projects that emphasize the use of features which were discussed.

Point out that the normal shift of the keyboard is alphabetic when punching without program control. Show how the numeric shift key must be held down when punching digits.

CONTENT	TEACHING SUGGESTIONS
d. Duplicate key e. Error reset f. Left-zero g. Skip h. Alternate program (program 2)	Show how to do the following: • Add an algebraic sign to a numeric fi character by combining punches • Repeat using the duplicate key • Unlock the keyboard with the error-re • Feed cards with the auto-feed switch positions • Print information along the top of a • Eject cards from the bed using the cl
D. Backspace key	
E. Functional control switches 1. Auto feed 2. Auto skip/dup 3. Print 4. Program select 5. Clear	
F. Program unit 1. Column indicator 2. Program drum 3. Program control card 4. Star wheels 5. Program control lever 6. Pressure-roll release lever	Explain the operation of the column indicator release lever. Discuss program control at a Show how to position the program control lever punching.
G. Chip box and fuses	
III. Manual Keypunching	
A. Card feeding - Auto feed switch	Give a short assignment in order that student themselves with the various operating feature machine. Include in the assignment items suc • Duplication - with and without error e • Manual insertion of cards in both punc stations • Removal of cards from card stations us release lever.
B. Keyboard shifting 1. Alphabetic data 2. Numeric data	
C. Card stacking 1. Release key 2. Clear switch	Indicate the importance of concentrating on a proper techniques. Point out that speed will

Nonbuffered Card Punch Machines

TEACHING SUGGESTIONS

Duplicate key

Error reset

Left-zero

Skip

Alternate program (program 2)

key

control switches

feed

skip/dup

t

ram select

r

unit

column indicator

ram drum

ram control card

wheels

ram control lever

pressure-roll release lever

and fuses

punching

feeding — Auto feed

shifting

alphanumeric data

numeric data

locking

erase key

switch

Show how to do the following:

- Add an algebraic sign to a numeric field or create a special character by combining punches
- Repeat using the duplicate key
- Unlock the keyboard with the error-reset or backspace key
- Feed cards with the auto-feed switch in the ON and OFF positions
- Print information along the top of a card
- Eject cards from the bed using the clear switch

Explain the operation of the column indicator and pressure-roll release lever. Discuss program control at a later time.

Show how to position the program control lever for manual punching.

Give a short assignment in order that students might familiarize themselves with the various operating features of the card punch machine. Include in the assignment items such as:

- Duplication - with and without error correction
- Manual insertion of cards in both punching and reading stations
- Removal of cards from card stations using the pressure-roll release lever.

Indicate the importance of concentrating on accuracy and using the proper techniques. Point out that speed will improve with practice.

Nonbuffered Card Punch Machine

CONTENT

TEACHING SUGGESTIONS

- IV. Numeric Keypunch Exercises
 - A. Program unit with blank card
 - B. Home keys
 - C. Fingering
- V. Alphabetic Keyboard Exercises
 - A. Home keys
 - B. Fingering
- VI. Program Control
 - A. Program card function
 - 1. Automatic keyboard shifting
 - 2. Automatic skipping
 - 3. Automatic duplication
 - 4. Field definition
 - B. Program unit
 - 1. Program drum
 - 2. Program control lever
 - 3. Star wheels
 - 4. Program control card
 - C. Program codes (program 1)
 - 1. 12 punch
 - 2. 11 punch
 - 3. Zero punch
 - 4. One punch

Check each student's work to see that correct fingerings are being used for both alphabetic and numeric

Select or design exercises which will familiarize the numeric keyboard. Emphasize the importance of using the correct fingering technique. Point out developing rhythm and indicate that speed will come with practice. (Ref. E)

Have students mount a blank card on the program control the numeric shift key.

Select or design exercises which will familiarize the alphabetic keyboard. Emphasize the importance of using the correct fingering techniques. (Ref. telephone directory)

Use a short alphanumeric project in which the student perform each of the automatic functions to just program control. This project will show the student machine can eliminate their shifting, skipping, and chores.

Demonstrate the techniques of mounting and dismounting control card.

Emphasize the importance of aligning the card punch program drum. (Ref. A, p. 29)

Explain program 1. (Ref. H, pp. 45-47)

Machine

TEACHING SUGGESTIONS

Check each student's work to see that correct fingering techniques are being used for both alphabetic and numeric key punching.

Exercises
with blank card

Select or design exercises which will familiarize the students with the numeric keyboard. Emphasize the importance of accuracy and using the correct fingering technique. Point out the need of developing rhythm and indicate that speed will improve with practice. (Ref. E)

Have students mount a blank card on the program drum to avoid using the numeric shift key.

board Exercises

Select or design exercises which will familiarize the students with the alphabetic keyboard. Emphasize the importance of accuracy and using the correct fingering techniques. (Ref. E, and local telephone directory)

d function
ic keyboard shifting
ic skipping
ic duplication
efinition

Use a short alphanumeric project in which the student must manually perform each of the automatic functions to justify the use of the program control. This project will show the students how the machine can eliminate their shifting, skipping, and duplicating chores.

t
drum
control lever
eels
control card

Demonstrate the techniques of mounting and dismounting a program control card.

es (program 1)

Explain program 1. (Ref. H, pp. 45-47)

n
h
nch
ch

CONTENT

TEACHING SUGGESTIONS

- D. Program control card design
 - 1. High-order column code
 - 2. Balance of field codes
- E. Program switch on keyboard
- F. Mounting a program control card
 - 1. Program control lever
 - 2. Clamping strip and handle
 - 3. Alining holes
- G. Alternate program control (program 2)
 - 1. 4 punch
 - 2. 5 punch
 - 3. 6 punch
 - 4. 7 punch

VII. Keyboard Proficiency

- A. Numeric and alphabetic keyboard exercises

- B. Application projects

Select or design assignments that allow the program control proficiency. Use additional introduce each of the other functions. After familiar with the various functions, use a s which includes all the functions. (Ref. A,

Explain program 2 after students have attain in using program 1. (Ref. A, pp. 34-35, 37; Point out that the alternate program control

- More than 80 columns are needed for d
- More than one type of card is used in

Emphasize the importance of accuracy, memori rhythm, and correct fingering techniques. D standards at the beginning of the practice s students become proficient, use timed exerci judging their competency. (Ref. A, pp. 13-3

Check to see that students are not watching drill and project sessions.

Intersperse application projects with keyboa variety of jobs to stimulate achievement.

Have students save the data cards they have projects in this section to use in the unit B, D, and E)

Use an autotutorial system to help students speed. (Ref. Dart's Card Punch Drills, if ava

TEACHING SUGGESTIONS

rol card design
er column code
of field codes

ch on keyboard

rogram control card
control lever
strip and handle
holes

rogram control

Select or design assignments that allow the students to develop program control proficiency. Use additional assignments to introduce each of the other functions. After students have become familiar with the various functions, use a summary assignment which includes all the functions. (Ref. A, pp. 22-29, 30-34)

Explain program 2 after students have attained a degree of proficiency in using program 1. (Ref. A, pp. 34-35, 37; Ref. H, pp. 45-47)
Point out that the alternate program control is used when:

- More than 80 columns are needed for data storage
- More than one type of card is used in the same batch

ency
alphabetic keyboard

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-31)

Check to see that students are not watching the keyboard during the drill and project sessions.

projects

Intersperse application projects with keyboard drills to provide a variety of jobs to stimulate achievement.

Have students save the data cards they have created from the projects in this section to use in the unit on verifying. (Ref. A, B, D, and E)

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills, if available)

- • -

18A

UNIT 3

PUNCHED CARD VERIFIERS

OBJECTIVES

At the conclusion of this unit, the student should be able to:

- Locate and correct errors in punched cards using the error notch as a guide
- Verify a deck of punched cards using program control with automatic skipping, automatic duplication, and numeric and alphabetic field definition
- Locate, identify, and correct all existing errors in a deck of punched cards in a 15 minute verification project with a minimum speed of 5,000 strokes per hour

CONTENT

TEACHING SUGGESTIONS

I. Functions of a Card Verifier

Students need keypunching skills and a knowledge of control for this unit.

Discuss the importance of accuracy relative to the function of the card verifier.

Point out the advisability of having the cards verified by another worker.

II. Operating Features

A. Main-line switch

Explain and demonstrate the principles and operation of the card verifier. Limit the detailed explanation to the features of the verifier.

- ##### B. Card stations
1. Card hopper
 2. Card bed
 - a. Verifying station
 - b. Reading station
 3. Card stacker

Show the passage of a card through the different stations during the verifying operation.

- ##### C. Keyboard
1. Character keys
 2. Functional control keys
 - a. Shift keys
 - b. Release, register, feed
 - c. Ver/dup key

Relate the keyboard and functional controls of the verifier to the controls and functions of the card punch machine.

Demonstrate how to verify a simple job using the procedures associated with the different types of verifiers.

PUNCHED CARD VERIFIERS

this unit, the student should be able to:

rect errors in punched cards using the error notch as a guide
of punched cards using program control with automatic skipping, automatic verify
nd numeric and alphabetic field definition
fy, and correct all existing errors in a deck of punched cards in a 15 minute timed
roject with a minimum speed of 5,000 strokes per hour

TEACHING SUGGESTIONS

Students need keypunching skills and a knowledge of program control for this unit.

Card Verifier

Discuss the importance of accuracy relative to punched cards and the function of the card verifier.

Point out the advisability of having the cards of one operator verified by another worker.

ures
switch

Explain and demonstrate the principles and operating features of the card verifier. Limit the detailed explanations to the unique features of the verifier.

ons
opper
ed
rifying station
ading station
tacker

Show the passage of a card through the different card stations during the verifying operation.

cter keys
lional control keys
hift keys
elease, register, feed
er/dup key

Relate the keyboard and functional controls of the verifier to the controls and functions of the card punch machines.

Demonstrate how to verify a simple job using the various retry procedures associated with the different types of machines.

CONTENT

TEACHING SUGGESTIONS

- | | |
|---|--|
| <ul style="list-style-type: none"> d. Error reset key (MP/ER) e. Skip key f. Alternate program (program 2) | <p>Show how the error-reset key (MP/ER) is used board when an error is detected.</p> |
| <p>D. Error light</p> | |
| <p>E. Functional control switches</p> <ul style="list-style-type: none"> 1. Auto feed 2. Auto skip/dup 3. Program select 4. Clear | <p>Point out how automatic feeding is suspended card is detected.</p> |
| <p>F. Program unit</p> <ul style="list-style-type: none"> 1. Column indicator 2. Program drum and program card 3. Program control lever 4. Pressure roll-release lever | <p>Emphasize the importance of alining the card program drum. (Ref. A, p. 29)</p> <p>Show how the pressure-roll release lever is u cards.</p> |
| <p>III. Operating Principles</p> | <p>Explain the difference between manual and aut punched cards.</p> |
| <p>A. Manual verification</p> | |
| <p>B. Automatic verification</p> | <p>Demonstrate the operation of a card verifier</p> |
| <p>C. OK notch</p> | <ul style="list-style-type: none"> • Automatic card feeding • Error-free card (OK notch) • Error detection <ul style="list-style-type: none"> • Three attempts to verify • Error notch • Operator notation on error card • With program control • Without program control |
| <p>D. Error detection</p> <ul style="list-style-type: none"> 1. Keyboard locking 2. Error light 3. Locating the error - column indicator 4. Error reset key (MP/ER) 5. Retry procedure | |
| <p>E. Error notation</p> <ul style="list-style-type: none"> 1. Error notch 2. Operator notation on card | <p>Have students verify cards containing a variet familiarize them with the different types of they may encounter.</p> |

TEACHING SUGGESTIONS

error reset key (MP/ER)
 skip key
 terminate program
 program 2)

Show how the error-reset key (MP/ER) is used to unlock the keyboard when an error is detected.

control switches
 feed
 skip/dup
 select

Point out how automatic feeding is suspended when an error card is detected.

indicator
 drum and program

Emphasize the importance of aligning the card properly on the program drum. (Ref. A, p. 29)

control lever
 pressure roll-release lever

Show how the pressure-roll release lever is used to remove jammed cards.

principles
 verification

Explain the difference between manual and automatic verification of punched cards.

verification

Demonstrate the operation of a card verifier including:

condition
 and locking
 light
 indicating the error -
 indicator
 error reset key (MP/ER)
 procedure

- Automatic card feeding
- Error-free card (OK notch)
- Error detection
 - Three attempts to verify
 - Error notch
 - Operator notation on error card
- With program control
- Without program control

condition
 notch
 error notation on card

Have students verify cards containing a variety of errors to familiarize them with the different types of error conditions that they may encounter.

Punch Card Verifiers

CONTENT

3. Multiple errors in a single field-skip key
4. Multiple error fields
 - a. Release key
 - b. Complete card remake

IV. Operating Suggestions

- A. Starting a verifying operation
- B. Stopping a verifying operation
- C. Engaging the program reading mechanism
- D. Spacing over blank columns
- E. Feeding a single card
- F. Locking keyboard
- G. Suspending automatic verification on first card

V. Verification Proficiency

- A. Numeric verification projects
- B. Alphabetic verification projects

TEACHING SUGGESTIONS

Suggest tips that students may use to improve their work after they have gained some proficiency in the card verifier. Giving students too much information will tend only to confuse them. Include such tips as:

- Use the functional controls when temporary interruptions occur instead of disengaging the mechanism.
- Place single cards to be verified directly in the verifier instead of the hopper.
- Use the verify/duplication key to space columns when the same columns are unpunched on a card or when there is no preceding card.

Have students verify the cards they produced in unit 2. Also, new projects may be assigned. Have students punch a deck of cards and then verify them.

Assign different keypunching projects to teams and then have them exchange decks for verification. (D, and E)

— • —

TEACHING SUGGESTIONS

errors in a single
tip key
error fields
ase key
lete card remake

tions
verifying operation
verifying operation
e program reading

r blank columns

ingle card

board

automatic verification
rd

proficiency
ification projects

verification projects

Suggest tips that students may use to improve their performance after they have gained some proficiency in the operation of the card verifier. Giving students too much information at one time will tend only to confuse them. Include such tips as:

- Use the functional controls when temporary changes or interruptions occur instead of disengaging the reading mechanism.
- Place single cards to be verified directly into the card bed instead of the hopper.
- Use the verify/duplication key to space over unpunched columns when the same columns are unpunched in the preceding card or when there is no preceding card.

Have students verify the cards they produced from the assignments completed in unit 2. Also, new projects may be assigned where students will punch a deck of cards and then verify them.

Assign different keypunching projects to teams of two students and then have them exchange decks for verification. (Ref. A, B, D, and E)

— • —

BUFFERED CARD PUNCH/VERIFIERS

OBJECTIVES:

At the conclusion of this unit the student should be able to:

- Explain the functions of the buffered card punch/verifier
- Repunch (correct) error cards
- Add data to an existing card
- Design and create a program card with numeric and alphabetic field definition, automatic skipping, and left-zero insertion
- Store a program and punch out to verify memory
- Punch numeric and alphabetic data using program control with automatic skipping, automatic skipping, and left-zero insertion
- Verify a deck of punched cards using the procedures for single character correction, one field (field correction), and entire record correction
- Attain a minimum speed of 5,000 strokes per hour with no more than 10 corrections in punch-verify assignment

CONTENT

TEACHING SUGGESTIONS

- | | |
|--|--|
| I. Functions of a Buffered Card Punch/Verifier | Demonstrate card handling techniques such as |
| A. Creating original records | Explain and demonstrate functions of the buffered card punch/verifier. Place students at each of the demonstration units and ask them to perform the function as it is demonstrated. Point out the basic differences among the various types of verifiers in your installation. Detailed explanation of operating procedures should be given after they have been able to perform the basic functions. |
| B. Adding data to punched records | |
| C. Correcting error records | |
| D. Duplicating records
(remaking damaged cards) | |
| E. Verifying punched cards | |
| II. Advantages of a Buffered Card Punch/Verifier | Discuss data storage when the card is complete. Explain the advantage of immediate punching of a card on a nonbuffered punch/verifier. |
| A. Capable of storing data | Demonstrate how an error may be corrected during punching operation. Point out how this operation saves materials. |
| B. Immediate error correction before punching | |

BUFFERED CARD PUNCH/VERIFIERS

f this unit the student should be able to:

functions of the buffered card punch/verifier

rect) error cards

an existing card

create a program card with numeric and alphabetic field definition, automatic duplication, skipping, and left-zero insertion

ram and punch out to verify memory

c and alphabetic data using program control with automatic skipping, automatic duplication, b insertion

k of punched cards using the procedures for single character correction, multiple errors in field correction), and entire record correction

imum speed of 5,000 strokes per hour with no more than 10 corrections in a 30-minute timed assignment

TEACHING SUGGESTIONS

a Buffered Card

r

original records

ata to punched records

g error records

ng records

y damaged cards)

y punched cards

a Buffered Card

r

f storing data

error correction

nching

Demonstrate card handling techniques such as joggling and fanning.

Explain and demonstrate functions of the buffered card punch/verifier. Place students at each of the demonstration machines and ask them to perform the function as it is explained. Point out the basic differences among the various types of card punch/verifiers in your installation. Detailed explanations of the operating procedures should be given after the students know how to perform the basic functions.

Discuss data storage when the card is complete as contrasted to the immediate punching of a card on a nonbuffered machine.

Demonstrate how an error may be corrected during the punching operation. Point out how this operation saves both time and materials.

Buffered Card Punch/Verifiers

CONTENT

- C. Immediate error correction during verification
- D. Multiple program levels
- E. High-speed card read-in
- F. Single machine for both punch and verify operations
- G. Some overlap of operations

III. Operating Features

- A. Main-line switch
- B. Card stations
 - 1. Card hopper — input magazine
 - 2. Punch station — visible station
 - 3. Auxiliary input
 - 4. Stacker switch
- C. Keyboard
 - 1. Character keys
 - a. Numeric arrangement
 - b. Alphabetic arrangement
 - c. Special characters
 - 2. Functional control switches
 - a. Punch/verify
 - b. Print
 - c. Auto feed
 - d. Auto skip/dup
 - e. Clear
 - f. Program mode dial
 - 3. Functional control keys and buttons
 - a. Read
 - b. Interpret

TEACHING SUGGESTIONS

Compare the three-operator system using nonbuffered the two-operator system using buffered machines required for the operation and the handling of

Discuss the need for more than two program level control has been introduced.

Explain the operating features of the buffered in your installation. Use manufacturers' reference information relating to specific machines. Prepare a summary sheet which shows these variations.

Demonstrate only those controls which the student using the machines.

Assign projects that involve the basic control the other assignments introduce the additional a time. Avoid using large projects.

Have students concentrate on the operating procedure on proficiency at this point. When the student working knowledge of the machine's features, assign projects which will develop their proficiency.

Demonstrate how to shift the keyboard when program is not used. Point out that this operation varies to machine.

ifiers

TEACHING SUGGESTIONS

error correction
ification

Compare the three-operator system using nonbuffered machines with the two-operator system using buffered machines as to time required for the operation and the handling of the cards.

ogram levels

card read-in

Discuss the need for more than two program levels after program control has been introduced.

line for both punch
operations

p of operations

res
witch

Explain the operating features of the buffered card punch/ verifiers in your installation. Use manufacturers' reference manuals for information relating to specific machines. Prepare and distribute a summary sheet which shows these variations.

ns
pper — input magazine
tation — visible

ry input
switch

Demonstrate only those controls which the students need to begin using the machines.

er keys
eric arrangment
habetic arrangement
cial characters
nal control switches
ch/verify

Assign projects that involve the basic controls first. Then, have the other assignments introduce the additional controls a few at a time. Avoid using large projects.

nt
o feed
o skip/dup
ar

Have students concentrate on the operating procedures rather than on proficiency at this point. When the students have a good working knowledge of the machine's features, assign exercises and projects which will develop their proficiency.

gram mode dial
nal control keys
tons
d
erpret

Demonstrate how to shift the keyboard when program control is not used. Point out that this operation varies from machine to machine.

CONTENT

TEACHING SUGGESTIONS

- | | |
|---|--|
| <p>c. Backspace
 (1) Character
 (2) Field
 (3) Record (home)</p> <p>d. Left-zero control
 (right-justify)</p> <p>e. Shift keys</p> <p>f. Feed, register, release
 (eject)</p> <p>g. Duplicate</p> <p>h. Multiple punch</p> <p>i. Program select</p> <p>j. Skip</p> <p>k. Verify correct (correct)</p> <p>4. Indicators</p> <p> a. Interlock</p> <p> b. Nonmatch</p> <p> c. Program 2</p> <p> d. Alphabetic shift</p> <p>IV. Manual Punching Operations</p> <p> A. Preparing for operation</p> <p> 1. Fill hopper</p> <p> 2. Main-line switch</p> <p> 3. Clear card bed</p> <p> 4. Set functional controls</p> <p> 5. Clear data storage</p> <p> 6. Enter constant data</p> <p> a. Manual entry</p> <p> b. Master card entry</p> <p> c. Master card and
 manual entry</p> <p> B. Punching new data cards
 (no program)</p> <p> 1. Feed card</p> <p> 2. Entering data-shifting</p> <p> 3. Punching out card</p> | <p>Show how to operate the various backspace key appropriate use for each key.</p> <p>Demonstrate how to clear memory in different Explain that memory is cleared to prevent the card being repeated on the following card.</p> <p>Explain the conditions which cause each of the to light up. Demonstrate how to correct each the device to normal operation.</p> <p>Assign a short project that involves all manual the next assignment include a field to be duplicated students are familiar with the machines, use a which include the special functions of remaking correcting error cards, and adding data to existing</p> <p>Demonstrate how to clear data storage by using clear switch.</p> <p>Show how to investigate and correct card feed as:</p> <ul style="list-style-type: none"> • Cover over feed knives • Small pieces of cards from a previous objects in transport feed mechanism |
|---|--|

NT

TEACHING SUGGESTIONS

Backspace
 (1) Character
 (2) Field
 (3) Record (home)
 Left-zero control
 (right-justify)
 Shift keys
 Feed, register, release
 (eject)
 Duplicate
 Multiple punch
 Program select
 Skip
 Verify correct (correct)
 Lock
 Interlock
 Mismatch
 Program 2
 Alphabetic shift

Show how to operate the various backspace keys. Identify the appropriate use for each key.

Demonstrate how to clear memory in different types of machines. Explain that memory is cleared to prevent the data for one card being repeated on the following card.

Operating Operations
 for operation
 Hopper
 Line switch
 Card bed
 Functional controls
 Data storage
 Constant data
 Manual entry
 Master card entry
 Master card and
 Manual entry

Explain the conditions which cause each of the operating indicators to light up. Demonstrate how to correct each problem and return the device to normal operation.

Assign a short project that involves all manual punching. Have the next assignment include a field to be duplicated. After students are familiar with the machines, use additional projects which include the special functions of remaking damaged cards, correcting error cards, and adding data to existing cards.

Demonstrate how to clear data storage by using the skip key or clear switch.

New data cards
 Jam
 Card
 Data-shifting
 Out card

Show how to investigate and correct card feeding failures such as:

- Cover over feed knives
- Small pieces of cards from a previous jam or other foreign objects in transport feed mechanism

Buffered Card Punch/Verifiers

CONTENT

TEACHING SUGGESTIONS

- Damage to the 12- or 9-edge of a card

- C. Remaking damaged cards
 - 1. Loading data from old card
 - 2. Feeding new card
 - 3. Duplicating data
 - 4. Punching out new card
- D. Correcting error cards
 - 1. Loading data from error card
 - 2. Feeding new card
 - 3. Duplicating correct data
 - 4. Keying corrections manually
 - 5. Punching out new card

Have students become proficient with punching manual and with program control, before going operations. Point out that punching skills are a job, whereas, verifier operation is of only to an employer.

Have students become proficient using one type they start to operate another. Operating first another tends to be confusing.

V. Numeric Keypunch Exercises

- A. Numeric shift
 - 1. Program mode dial
 - 2. Shift key

Assign projects which will familiarize student keyboard. Emphasize the importance of accurate fingering techniques.

B. Home keys

Point out the importance of accuracy and the accuracy. Indicate that speed will develop with practice.

C. Fingering

Check to see that the students' eyes are on the keyboard, not on the keyboard.

VII. Combined Alphabetic and Numeric Drills

Assign projects that combine the use of the numeric keyboards.

VIII. Program Control

- A. Function of program card
 - 1. Shifting
 - 2. Automatic skipping
 - 3. Automatic duplication
 - 4. Field definition
 - 5. Left-zero insertion

Assign a short project which involves the manual of the program functions. Then, introduce the program control.

TEACHING SUGGESTIONS

- Damage to the 12- or 9-edge of a card

damaged cards
ing data from old card
ing new card
icating data
hing out new card

Have students become proficient with punching operations, both manual and with program control, before going into the verifier operations. Point out that punching skills are necessary to obtain a job, whereas, verifier operation is of only secondary interest to an employer.

ing error cards
ing data from error card
ing new card
icating correct data
ng corrections manually
hing out new card

Have students become proficient using one type of machine before they start to operate another. Operating first one machine then another tends to be confusing.

unch Exercises
shift
ram mode dial
t key

Assign projects which will familiarize students with the numeric keyboard. Emphasize the importance of accuracy and correct fingering techniques.

s

Point out the importance of accuracy and the development of rhythm. Indicate that speed will develop with practice.

g

Check to see that the students' eyes are on the source document and not on the keyboard.

habetic and Numeric

Assign projects that combine the use of the numeric and alphabetic keyboards.

rol
of program card
ting
omatic skipping
omatic duplication
d definition
-zero insertion

Assign a short project which involves the manual performance of each of the program functions. Then, introduce the function of program control.

CONTENT

TEACHING SUGGESTIONS

- B. Codes for program card
1. First column of field
 2. Balance of field coding
 3. Last column code for left-zero fields
4. Alternate program codes
- a. Program 2
 - b. Multiple program levels
- C. Storage of program codes
1. Setting functional controls
 2. Inserting program card (auxiliary input)
 3. Reading-in the card
 4. Punching out program to verify proper loading.
- D. Application projects
- IX. Keyboard Proficiency
- A. Numeric keyboard drills

Assign a series of projects with each one into function such as:

- Alpha and numeric fields, no blank field
- Alpha and numeric fields with auto skip
- Skipping and duplicating
- Left-zero insertion

Assign projects that use several different functions for students with program card preparation.

Discuss alternate program control.

Point out that some machines have only two program levels. Some machines use different codes such as levels 12 for program 1 and levels 4, 5, 6, and 7 for program 2.

Other machines have the capability of storing programs at the same time. These machines use codes (12, 11, 0, and 1) but store the programs in different memory locations.

Present both of the above concepts even though the machine has only one type of machine.

Have students store several programs. Check to see if programs have been properly loaded.

Assign projects that will help students develop using the functions of program control. (Ref. A, Ref. E)

Emphasize the importance of accuracy, memorization, rhythm, and correct fingering techniques. Do

TEACHING SUGGESTIONS

program card
column of field
e of field coding
column code for left-
fields

Assign a series of projects with each one introducing a new function such as:

- Alpha and numeric fields, no blank fields
- Alpha and numeric fields with auto skipping
- Skipping and duplicating
- Left-zero insertion

Assign projects that use several different formats to familiarize students with program card preparation.

ate program codes
rogram 2
multiple program levels

Discuss alternate program control.

Point out that some machines have only two program levels. These machines use different codes such as levels 12, 11, 0, and 1 for program 1 and levels 4, 5, 6, and 7 for program 2.

Other machines have the capability of storing up to six different programs at the same time. These machines use the same program codes (12, 11, 0, and 1) but store the programs in different memory locations.

Present both of the above concepts even though your installation has only one type of machine.

program codes
g functional controls
ing program card
(ary input)
g-in the card
ng out program to
proper loading.

Have students store several programs. Check to see that the programs have been properly loaded.

n projects

Assign projects that will help students develop proficiency in using the functions of program control. (Ref. A, pp. 29-32; Ref. E)

ciency
yboard drills

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time

26 A

Buffered Card Punch/Verifiers

CONTENT

TEACHING SUGGESTIONS

B. Alphabetic keyboard drills

standards at the beginning of the practice session. When students become proficient, use timed exercises for judging their competency. (Ref. A, pp. 13-21)

C. Application projects

Intersperse application projects with keyboard drills.

Use an autotutorial system to help students develop skills. (Ref. Dart's Card Punch Drills)

Have students save the data cards they are making in a verification section.

X. Verification

A. Need

1. Accuracy of input
2. Time and money savings

Explain the operation of verification. This takes place in a short time because most of the controls are already explained and used by the student in the punching operation.

B. Cycle

1. Keypunch to verifier to keypunch for corrections
2. Advantages of combined machine
 - a. Fewer physical machines
 - b. Only two operators involved
 - c. Immediate card correction

Contrast performing the operations of punching using separate machines with doing the same operations on one machine. Emphasize the savings in time, money, and space by performing the operations performed on one machine.

C. Operations

- * 1. Manual verifying
2. Duplicate verifying
3. Bypassing
4. Skipping

Have students verify the cards they produced in the punching operation. Ask students to exchange cards to simulate a program control. Most verifying jobs use program control, so it is not necessary to have any manual assignments.

D. Procedures

1. Machine setup
 - a. Card input
 - b. Functional controls
 - c. Program card

Have students concentrate on developing speed and accuracy. They have a good working knowledge of the verification operation.

Demonstrate how to:

- Load a master card when using automatic verification.

TEACHING SUGGESTIONS

ic keyboard drills

standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-21)

ion projects

Intersperse application projects with keyboard drills.

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills)

Have students save the data cards they are making for use in the verification section.

racy of input
and money savings

Explain the operation of verification. This topic may be covered in a short time because most of the controls and features have already been explained and used by the students in the punching operation.

unch to verifier to
unch for corrections
ntages of combined
ine
Fewer physical machines
Only two operators
involved
Immediate card
correction

Contrast performing the operations of punching and verifying using separate machines with doing the same operations using one machine. Emphasize the savings in time, money, and space by having the operations performed on one machine.

ns
al verifying
icate verifying
ssing
ping

Have students verify the cards they produced in the punching section. Ask students to exchange cards to simulate a practical situation. Most verifying jobs use program control, so it is not necessary to have any manual assignments.

es
ine setup
Card input
Functional controls
Program card

Have students concentrate on developing speed and accuracy after they have a good working knowledge of the verifier.

Demonstrate how to:

- Load a master card when using automatic verification

CONTENT

TEACHING SUGGESTIONS

2. Error detection
 - a. Error light
 - b. Keyboard locking
 - c. Retry procedure
 - d. Error correction
 - (1) single character correction
 - (2) field correction
 - (3) record correction
 - (4) auxiliary input
3. OK notch
 - a. Error-free card
 - b. Corrected card

- Suspend automatic verification for the group
- Correct errors

Have students verify cards containing errors of different types of error conditions which they

— • —

KEY-TO-TAPE DATA RECORDERS

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Explain the function of key-to-tape data recorders
- Mount, load, unload, and dismount a reel of tape proficiently
- Record numeric and alphabetic data onto a reel of magnetic tape manually and with program automatic skipping, automatic duplication, left-zero insertion, and numeric and alphabetic
- Verify a prerecorded reel of tape using single character correction and field correction
- Search a reel of tape and change data in an existing record, add data behind a specific record, or delete an existing record
- Design, enter, and verify a program which contains numeric and alphabetic field definitions, automatic skipping, automatic duplication, and left-zero insertion
- Attain a minimum speed of 6,000 strokes per hour with no more than 10 corrections in a record-verify assignment

TEACHING SUGGESTIONS

detection
 error light
 keyboard locking
 entry procedure
 error correction
) single character
 correction
) field correction
) record correction
) auxiliary input
 ch
 error-free card
 corrected card

- Suspend automatic verification for the first card of a group
- Correct errors

Have students verify cards containing errors to show them the different types of error conditions which they may encounter.

— • —

UNIT 5

KEY-TO-TAPE DATA RECORDERS

In this unit, the student should be able to:

operation of key-to-tape data recorders
 load, and dismount a reel of tape proficiently
 and alphabetic data onto a reel of magnetic tape manually and with program control using
 loading, automatic duplication, left-zero insertion, and numeric and alphabetic field definition
 recorded reel of tape using single character correction and field correction
 of tape and change data in an existing record, add data behind a specific record, and blank
 record
 and verify a program which contains numeric and alphabetic field definition, automatic
 duplication, and left-zero insertion
 at a speed of 6,000 strokes per hour with no more than 10 corrections in a 30-minute timed
 assignment

28A

Key-to-Tape Data Recorders

CONTENT

- I. Introduction
 - A. Functions
 - 1. Data entry
 - 2. Verification
 - B. Advantages of key-to-tape machines
 - 1. Faster input
 - 2. Larger capacity
 - 3. Stable record sequence
 - 4. One machine doing work of two
 - C. Disadvantages of key-to-tape machines
 - 1. Difficulty in altering individual records
 - 2. Inability to visibly inspect data
- II. Components of the Key-to-Tape Machine
 - A. Tape handler unit
 - 1. Supply and takeup reels
 - 2. Read and write head
 - 3. Vacuum columns
 - B. Tape handler control panel
 - 1. On and off switch
 - 2. Tape load and unload buttons
 - 3. Record counter

TEACHING SUGGESTIONS

Introduce the topic of key-to-tape machines after the students have learned how to operate card punch machines. The topics of data recording and machine functions are easily presented in this order.

Discuss briefly the various operations that can be performed with the key-to-tape system. Detailed explanation of each operation when the specific topic is taught.

Discuss the advantages of key-to-tape machines in the following items as:

- Speed of input
- Capacity
- Key punch and verifier operations

Discuss the disadvantages of key-to-tape machines in the following items as:

- Procedure for changing individual records
- Method of inspecting data

Demonstrate and explain the functions of the various components of key-to-tape machines. Some of the terminology may vary with machines but the concepts remain the same. Refer to the individual manufacturer's manuals for specific operating procedures.

Explain, with each operation, the function of the various controls and indicators. As the students progress, present the additional controls which are needed for the operation and indicators which apply to the next operation.

TEACHING SUGGESTIONS

Introduce the topic of key-to-tape machines after students have learned how to operate card punch machines. The concepts of data recording and machine functions are easier to understand when presented in this order.

Discuss briefly the various operations that can be performed with the key-to-tape system. Detailed explanations can be given when the specific topic is taught.

entry
location

of key-to-tape

Discuss the advantages of key-to-tape machines including such items as:

input
capacity
record sequence
machine doing work of two

- Speed of input
- Capacity
- Key punch and verifier operations

ages of key-to-tape

Discuss the disadvantages of key-to-tape machines including such items as:

ulty in altering
dual records
ity to visibly
t data

- Procedure for changing individual records
- Method of inspecting data

the Key-to-Tape

Demonstrate and explain the functions of the various components of key-to-tape machines. Some of the terminology used in the outline may vary with machines but the concepts remain the same regardless of the device. Refer to the individual manufacturers' reference manuals for specific operating procedures.

er unit
and takeup reels
and write head
columns

er control panel
off switch
load and unload buttons
counter

Explain, with each operation, the function of the keyboard switches and other functional controls and indicators. Include only those controls which are needed for the operation being presented. Then, as the students progress, present the additional controls, switches, and indicators which apply to the next operation.

CONTENT

TEACHING SUGGESTIONS

- C. Memory and control unit
 - 1. Data buffers
 - 2. Program buffers
 - 3. Control unit
- D. Keyboard
 - 1. Functional control switches
 - a. Mode switch
 - b. Program switch
 - c. Auto release switch
 - d. Auto dup/skip
 - e. Data/prog switch
 - 2. Display panel
 - a. Character display
 - b. Column indicator
 - c. Status indicators
 - 3. Character keys
 - 4. Functional controls keys
 - a. Shift
 - b. Backspace
 - c. Error
 - d. Left-zero
 - e. Duplicate
 - f. Program 1 and 2

Demonstrate how data and programs remain in memory until information is entered

Discuss the basic function of each area of the panel including:

- Mode setup
- Inquiry
- Machine status

Show how to translate machine coded displays.

Explain the meaning of the various error indicators and the corrective procedures necessary for each situation.

Demonstrate the use of the functional control keys used to record data.

Point out the interlocking condition on some machines when the backspace key is used.

III. Key-to-Tape Operations

- A. Data entry
 - 1. Recording original data
 - 2. With and without program control
- B. Data verify
- C. Search
- D. Program entry
- E. Program verify

Define each of the functions briefly. Detailed instructions wait until the students start specific operations.

Relate the various key-to-tape operations to similar operations performed on card punch machines.

Encourage students to use the operator's reference material supplied by the various manufacturers when setting up for different operations.

TEACHING SUGGESTIONS

d control unit
buffers
am buffers
ol unit

Demonstrate how data and programs remain in memory until new information is entered

ional control switches
ode switch
rogram switch
uto release switch
uto dup/skip
ata/prog switch
ay panel
haracter display
olumn indicator
atus indicators
eter keys
ional controls keys
ift
ackspace
rror
ft-zero
pplicate
rogram 1 and 2

Discuss the basic function of each area of the keyboard control panel including:

- Mode setup
- Inquiry
- Machine status

Show how to translate machine coded displays.

Explain the meaning of the various error indicators and show the corrective procedures necessary for each situation.

Demonstrate the use of the functional control keys when they are used to record data.

Point out the interlocking condition on some machines when the backspace key is used.

erations

Define each of the functions briefly. Detailed explanations should wait until the students start specific operations.

ing original data
nd without program
1

Relate the various key-to-tape operations to similar functions performed on card punch machines.

y

Encourage students to use the operator's reference guides that are supplied by the various manufacturers when setting up the machines for different operations.

try

rify

Key-to-Tape Data Recorders

CONTENT

TEACHING SUGGESTIONS

IV. Tape Mounting and Dismounting

- A. Slide-down window
- B. Supply and takeup reels
- C. Read and write head
- D. Vacuums
- E. Tape load and unload buttons
- F. Rewind key/switch

Demonstrate the techniques for handling tape cleaning, and loading. Explain the variations of different machines.

Have students practice loading and unloading until they become proficient tape handlers.

V. Manual Data-Entry Procedures

- A. Functional Controls
 - 1. Mode switch
 - 2. Auto release
 - 3. Auto dup/skip
 - 4. Program switch
- B. Data entry
 - 1. Keyboard shifting
 - 2. Record release
- C. Termination of operation
 - 1. Tape mark
 - 2. Rewinding the tape
 - 3. Unloading and dismounting
- D. Application project

Describe the purposes and operation of:

- Auto release in off position
- Auto-dup/skip in off position
- Program in zero (off) position

Have students enter data into the memory. As data is entered, have students backspace and examine the tape for each column to give them practice in decoding.

Explain the function of the tape mark at the end of the record.

Assign a short project that uses all types of data (numeric, and mixed) such as a simple name and address to become familiar with the operating procedures of the machine.

VI. Tape Search

- A. Purpose
 - 1. Alter data
 - 2. Continue operation
 - 3. Delete data

Explain the necessity for a search operation. Describe the procedures used for tape with those used for punch cards.

Discuss the purpose of the record identifier. Explain the use of codes with alphabetic fields relative to length.

orders

TEACHING SUGGESTIONS

and Dismounting
n window

Demonstrate the techniques for handling tape such as stacking, cleaning, and loading. Explain the variations that exist for different machines.

d takeup reels

write head

Have students practice loading and unloading reels of tape until they become proficient tape handlers.

and unload buttons

y/switch

entry Procedures

l Controls

switch

release

dup/skip

am switch

Describe the purposes and operation of:

- Auto release in off position
- Auto-dup/skip in off position
- Program in zero (off) position

y
ard shifting
d release

Have students enter data into the memory. As each character is entered, have students backspace and examine the character display for each column to give them practice in decoding.

on of operation
mark

ding the tape

ding and dismounting

Explain the function of the tape mark at the end of the data file.

on project

Assign a short project that uses all types of fields (alphabetic, numeric, and mixed) such as a simple name and address file to allow students to become familiar with the operating features of the machine.

e data
nue operation
e data

Explain the necessity for a search operation. Compare the search procedures used for tape with those used for punched cards.

Discuss the purpose of the record identifier. Compare numeric codes with alphabetic fields relative to length and uniqueness.

CONTENT

TEACHING SUGGESTIONS

B. Functional controls

1. Mode switch
2. Auto release
3. Auto dup/skip
4. Program switch

Emphasize the need to "space fill" all columns so the identifier does not occupy.

C. Operational procedures

1. Record identifier
2. Releasing to search
3. Verifying found record

Demonstrate the operating procedure. Show what happens when a record is not found.

Explain why the tape must be backspaced and how to verify the found record.

VII. Numeric and Alphabetic Keyboard Exercises

Assign projects that will provide practice in and familiarization with the numeric and alphabetic keyboard. Emphasize the importance of accuracy and correct techniques. Point out that speed will come with practice (Ref. A and E)

VIII. Program Control

A. Function

1. Field definition
2. Automatic skip and dup control
3. Automatic left-zero insertion

Have students use the manual project which they will show the advantages of program control.

Demonstrate how program control saves time and increases accuracy by automatically shifting the keyboard, duplicating data, and determining the number of columns in front of a number.

B. Program codes

1. First column of field
2. Balance of field

Explain how the first column program code stands for automatic functions and denotes the beginning of a field.

Explain the function of the balance of field code (automatic shifting).

C. Program design

1. Record description form
2. Program layout

Assign projects that give students practice in using record description forms and designing program layouts for different applications.

D. Program entry

1. Functional controls
2. Entry operation

TEACHING SUGGESTIONS

controls
switch
release
dup/skip
am switch

Emphasize the need to "space fill" all columns of the record that the identifier does not occupy.

al procedures
l identifier
ing to search
ing found record

Demonstrate the operating procedure. Show what happens when the record is not found.

Explain why the tape must be backspaced and read again before verifying the found record.

phabetic Keyboard

Assign projects that will provide practice in operating procedures and familiarization with the numeric and alphabetic keyboards. Emphasize the importance of accuracy and correct fingering techniques. Point out that speed will come with practice. (Ref. A and E)

l
definition
tic skip and dup
l
tic left-zero
ion

Have students use the manual project which they did previously to show the advantages of program control.

Demonstrate how program control saves time and results in improved accuracy by automatically shifting the keyboard, skipping, and duplicating data, and determining the number of zeroes to be placed in front of a number.

des
column of field

Explain how the first column program code starts and stops the automatic functions and denotes the beginning of the next field.

e of field

Explain the function of the balance of field codes (keyboard shifting).

sign
description form
m layout

Assign projects that give students practice in filling out record description forms and designing program layouts using several different applications.

try
onal controls
operation

Key-to-Tape Data Recorders

CONTENT

- E. Program verification
 - 1. Functional controls
 - 2. Procedure
 - a. Error detection
 - b. Error correction
- IX. Data Entry Using Program Control
 - A. Program design and entry
 - B. Operational procedures
 - 1. Functional controls
 - 2. Entry procedure
 - 3. Termination of operation
 - C. Application projects
- X. Data Verification with Program Control
 - A. Program design and entry
 - B. Operating procedure
 - 1. Functional controls
 - 2. Verification procedure
 - a. Error detection
 - b. Error correction
 - (1) Single character
 - (2) Entire field
 - c. End-of-record procedure
 - (1) No error
 - (2) Corrected record
 - 3. Termination of operation

TEACHING SUGGESTIONS

Demonstrate how to correct an error.

Use the projects that the students did for previous basis for practice in verifying and storing pr

Review how to design a program and enter it in

Discuss the setup for the first record of a job of the records.

Demonstrate the use of the shift, left-zero, s

Use the same project for program control that previously did manually. This will help reinforce on the advantages of program control.

Explain the need for verification.

Demonstrate how to start the operation by first into memory.

Explain and demonstrate how to correct a single errors in a field.

Explain how to erase the error record before record on the tape.

TEACHING SUGGESTIONS

ification
nal controls
re
or detection
or correction

Demonstrate how to correct an error.

Use the projects that the students did for project design as a basis for practice in verifying and storing programs. (Ref. G)

g Program Control
ign and entry

Review how to design a program and enter it into memory.

Discuss the setup for the first record of a job and for the balance of the records.

procedures
nal controls
procedure
tion of operation

Demonstrate the use of the shift, left-zero, skip, and release keys.

projects

Use the same project for program control that the students previously did manually. This will help reinforce the points made on the advantages of program control.

on with Program

Explain the need for verification.

ign and entry

procedure
nal controls

Demonstrate how to start the operation by first reading the record into memory.

ation procedure
or detection
or correction

Explain and demonstrate how to correct a single error and multiple errors in a field.

Single character
Entire field
-of-record procedure
No error
Corrected record
tion of operation

Explain how to erase the error record before rewriting the correct record on the tape.

CONTENT

TEACHING SUGGESTIONS

C. Application projects	Have the students verify the project they use program control. Additional practice can come from future data entry projects.
XI. Keyboard Proficiency	Emphasize the importance of accuracy, memorization of rhythm, and correct fingering techniques. Do this at the beginning of the practice sessions. As students become proficient, use timed exercises as a way of increasing speed. (Ref. A, pp. 13-21)
A. Numeric and alphabetic keyboard drills	
B. Application projects	Use an autotutorial system to help students develop skills. (Ref. Dart's Card Punch Drills)

— • —

KEY-TO-DISK DATA RECORDERS

OBJECTIVES:

At the conclusion of this unit, the student should be able to:

- Explain the function of key-to-disk recorders
- Record numeric and alphabetic data using numeric and alphabetic field definition, automatic duplication, and left-zero insertion
- Open a keystation in write, read, and verify modes
- Perform a batch append operation
- Verify a batch of data using single character correction and field correction
- Open a batch in verify mode and make a search, delete a record, change data, and insert
- Design a record format layout that contains automatic skipping and duplicating, left and numeric and alphabetic field definition and enter the format through the keystation
- Attain a minimum speed of 6,000 strokes per hour with no more than 10 corrections in verify assignment

TEACHING SUGGESTIONS

projects

Have the students verify the project they used previously for program control. Additional practice can come from verifying future data entry projects.

iciency
alphabetic
ills

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-21)

projects

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills)

— • —

UNIT 6

KEY-TO-DISK DATA RECORDERS

his unit, the student should be able to:

ction of key-to-disk recorders
and alphabetic data using numeric and alphabetic field definition, automatic skipping,
cation, and left-zero insertion
on in write, read, and verify modes
append operation
of data using single character correction and field correction
verify mode and make a search, delete a record, change data, and insert a record
format layout that contains automatic skipping and duplicating, left zero-insertion,
alphabetic field definition and enter the format through the keystation
n speed of 6,000 strokes per hour with no more than 10 corrections in a 30-minute timed unit-
at.

Key-to-Disk Data Recorders

CONTENT	TEACHING SUGGESTIONS
I. Introduction A. Functions 1. Creating new records 2. Modifying existing records 3. Verifying existing records B. Advantages 1. Computer controlled 2. Automatic format control 3. Quiet operation 4. Large capacity 5. Some overlap of operations 6. Simplified handling of media 7. Statistical feedback	Discuss briefly the various operations that can be performed by a key-to-disk system. Detailed explanations of the specific topic is taught. Point out the advantages of a computer controlled system to checking errors, coordinating functions, and so on. Compare the noise level of the key-to-disk system with a keypunch machine. Show how the total operation is speeded up because the system does not handle any media.
II. Components of the Key-to-Disk System A. Supervisor station 1. Console 2. Printer 3. Tape unit 4. System residence disk 5. Computer B. Keystation 1. Display unit 2. Keyboard	Discuss how to initialize the system at the start of a run. Show a few sample production reports that can be generated by the supervisor station. Demonstrate and explain the data flow cycle from the tape. Discuss the various types of keystation that are available on different machines.
III. Keystation Concepts A. Operating modes 1. Write 2. Read 3. Verify B. Variable record length C. Automatic format control 1. Keyboard shifting	Give a short demonstration of each operating mode to give an understanding of the capabilities of the system. Detailed explanations should be given when the differences between modes are taught. Compare the advantages of a variable length record with a fixed length concept of cards. Relate the term program to format when describing the operation of the system.

TEACHING SUGGESTIONS

Discuss briefly the various operations that can be performed with a key-to-disk system. Detailed explanations can be given when the specific topic is taught.

g new records
ng existing records
ng existing records

Point out the advantages of a computer controlled system relative to checking errors, coordinating functions, and reporting statistics.

or controlled
ic format control
operation
capacity
overlap of operations
fied handling of media
ical feedback

Compare the noise level of the key-to-disk system with a keypunch machine.

Show how the total operation is speeded up because the operator does not handle any media.

the Key-to-Disk System
station

Discuss how to initialize the system at the supervisor station.

Show a few sample production reports that can be obtained at the supervisor station.

hit
residence disk
er

Demonstrate and explain the data flow cycle from keystation to tape.

Discuss the various types of keystation that are available on different machines.

y unit
rd

Give a short demonstration of each operating mode to give students an understanding of the capabilities of the system. Detailed explanations should be given when the different operating modes are taught.

record length

Compare the advantages of a variable length record system with the fixed length concept of cards.

format control
rd shifting

Relate the term program to format when describing this function.

CONTENT

TEACHING SUGGESTIONS

2. Automatic functions

Explain the concept of prestoring the format a number to identify each.

D. Keystation setup

1. Operator number
2. Batch number
3. Format number

Explain the need for using identifying number batch, and format. Assign a permanent number have him use this number for his operator, batch number. This method will minimize students' other.

Explain with the aid of a chalkboard diagram on a disk and how the computer keeps track of

IV. Operating Features of Keystation

A. Display unit

1. Power switch
2. Screen adjustments
3. Screen displays

Show how to adjust the video screen for comfort

Show the various messages that may appear on explain in detail about each message at this

B. Keyboard

1. Indicators
2. Mode keys
3. Functional control keys
4. Data keys

Explain briefly the operation of the keyboard be already familiar with many of the functions previous machines. If this is the first machine detailed explanations for the operations that key or keys.

V. Data-Entry Operations (write mode)

A. New batch

1. Opening the keystation
2. Entering data
 - a. First record of the batch
 - b. Balance of the batch
3. Closing the batch

Enter the format for the first few assignments can concentrate on becoming familiar with the keystation.

Introduce the various functions of a record of projects involving:

- Alphabetic and numeric data
- Skipping
- Auto duplication
- Left-zero insertion

Explain the special features such as auto-balance control after the students have attained keys

TEACHING SUGGESTIONS

omatic functions

Explain the concept of prestoring the formats on disks and assigning a number to identify each.

ion setup
rator number
ch number
mat number

Explain the need for using identifying numbers for each operator, batch, and format. Assign a permanent number to each student and have him use this number for his operator, batch, and format number. This method will minimize students interfering with each other.

Explain with the aid of a chalkboard diagram the location of items on a disk and how the computer keeps track of data during processing.

eatures of Keystation
unit
er switch
een adjustments
een displays

Show how to adjust the video screen for comfortable viewing.

Show the various messages that may appear on the screen. Do not explain in detail about each message at this time.

d
icators
e keys
ctional control keys
a keys

Explain briefly the operation of the keyboard. Students should be already familiar with many of the functional controls from previous machines. If this is the first machine taught, hold the detailed explanations for the operations that utilize the specific key or keys.

Operations (write mode)
ch
ing the keystation
ering data
First record of the
batch
Balance of the batch
ing the batch

Enter the format for the first few assignments so that the students can concentrate on becoming familiar with the operation of the keystation.

Introduce the various functions of a record format by using a series of projects involving:

- Alphabetic and numeric data
- Skipping
- Auto duplication
- Left-zero insertion

Explain the special features such as auto-balance and check-digit control after the students have attained keystation proficiency.

Key-to-Disk Data Recorders

CONTENT

TEACHING SUGGESTIONS

- | | |
|--|--|
| <p>B. Batch append</p> <ol style="list-style-type: none">1. Reopening a batch2. Adding records3. Closing the batch <p>VI. Functions of the Read Mode</p> <ol style="list-style-type: none">A. Examine data just writtenB. Examine data being verifiedC. Independent read mode to scan a batch which has been closed <p>VII. Automatic Format Control</p> <ol style="list-style-type: none">A. Functions<ol style="list-style-type: none">1. Record layout2. Physical characteristics of field3. Control of automatic operationB. Designing a record format<ol style="list-style-type: none">1. Format layout form2. Field descriptorsC. Entering a record format through the keystation<ol style="list-style-type: none">1. Making corrections2. Assigning a format number <p>VIII. Verify Mode</p> <ol style="list-style-type: none">A. Functions | <p>Point out that the computer keeps track of the each batch entered so that only the batch number for a batch append operation. List the student supervisor's printer so students can check the</p> <p>List the batch before and after it has been a</p> <p>Have students change to read mode while entering the write mode and examine the data already on disk. Show students how to backspace to the batch and how to read forward.</p> <p>Compare the functions of a record format with on a keypunch.</p> <p>Assign a series of exercises so that the student familiar with all the design functions.</p> <p>Explain alternate format control at a later time</p> <p>Show how to correct an error if it is detected</p> <ul style="list-style-type: none">• During the entry of the codes• After the field has been entered <p>List each format on the supervisor station for purpose. Cancel each format so the students numbers for all the exercises.</p> <p>Have students record a batch of data. Then, demonstrate each of the functions performed</p> |
|--|--|

TEACHING SUGGESTIONS

ing a batch
records
the batch

Point out that the computer keeps track of the format number for each batch entered so that only the batch number need be given for a batch append operation. List the students' batches on the supervisor's printer so students can check the data visually.

List the batch before and after it has been appended.

e Read Mode
a just written
a being verified

Have students change to read mode while entering a batch in the write mode and examine the data already released onto the disk. Show students how to backspace to the beginning of the batch and how to read forward.

read mode to scan
ch has been closed

t Control

Compare the functions of a record format with that of a program card on a keypunch.

ayout
l characteristics of

of automatic operation

record format
layout form
escriptors

Assign a series of exercises so that the students will become familiar with all the design functions.

record format
keystation
corrections

Explain alternate format control at a later time.

Show how to correct an error if it is detected:

- During the entry of the codes
- After the field has been entered

ing a format number

List each format on the supervisor station printer for checking purpose. Cancel each format so the students can reuse the same numbers for all the exercises.

Have students record a batch of data. Then, use that batch to demonstrate each of the functions performed in the verify mode.

CONTENT

TEACHING SUGGESTIONS

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Checking for accuracy 2. Search operation <ol style="list-style-type: none"> a. Modify a record b. Delete a record c. Insert a record d. Continue an operation | <p>Discuss the need for the search operation. S impractical to start at the beginning of a ba</p> |
| <p>B. Operational procedures</p> <ol style="list-style-type: none"> 1. Opening the batch 2. Verifying the record <ol style="list-style-type: none"> a. Error detection b. Error correction <ol style="list-style-type: none"> (1) Single character (2) Entire field 3. Closing the batch | <p>Demonstrate the use of the reset and backspace correcting errors.</p> <p>Show how to close the keystation in mid-batch procedure would be used. Emphasize the impor the batch open when the keystation is unatten</p> |
| <p>IX. Keystation Operator Proficiency</p> <ol style="list-style-type: none"> A. Numeric keyboard drills B. Alphabetic keyboard drills C. Application projects <ol style="list-style-type: none"> 1. Alternate format control 2. Special features <ol style="list-style-type: none"> a. Auto-balance b. Check-digit control | <p>Emphasize the importance of accuracy, memoriz rhythm, and correct fingering techniques. Do at the beginning of the practice sessions. A become proficient, use timed exercises as a w competency. (Ref. A, pp. 13-21)</p> <p>Intersperse application projects with keyboar</p> <p>Take statistical reports from the supervisor students' progress in speed and accuracy. Ha each drill and project.</p> <p>Use an autotutorial system to help students d (Ref. Dart's Card Punch Drills)</p> |

TEACHING SUGGESTIONS

g for accuracy
operation
ify a record
ete a record
ert a record
tinue an operation

Discuss the need for the search operation. Show how it is impractical to start at the beginning of a batch each time.

procedures
the batch
ng the record
or detection
or correction
Single character
Entire field
the batch

Demonstrate the use of the reset and backspace-field key when correcting errors.

Show how to close the keystation in mid-batch. Explain when this procedure would be used. Emphasize the importance of never leaving the batch open when the keystation is unattended.

ator Proficiency
board drills
keyboard drills

Emphasize the importance of accuracy, memorization of the keyboard, rhythm, and correct fingering techniques. Do not set time standards at the beginning of the practice sessions. As the students become proficient, use timed exercises as a way of judging their competency. (Ref. A, pp. 13-21)

projects
te format control
features
p-balance
ck-digit control

Intersperse application projects with keyboard drills.

Take statistical reports from the supervisor station to gauge students' progress in speed and accuracy. Have students verify each drill and project.

Use an autotutorial system to help students develop rhythm and speed. (Ref. Dart's Card Punch Drills)

Glossary

Alining pin: A pin at the bottom of the program drum for inserting the drum into the socket of the machine.

Alphabetic field: A field which contains letters and spaces only.

Alphanumeric (Alphanumeric) field: A field which can contain any combination of valid characters (letters, digits, special characters, spaces).

Automated data processing: A process where data are handled with a minimum of human intervention. The process depends on recording original information in such a way that further use can be made of it without later rerecording.

Automation: A process in which work is done with a minimum of manual effort, usually including feedback and self-control.

Card column: One of the 80 vertical divisions of a card, normally accommodating one letter, digit, or special character.

Card hopper: The part of a card processing machine into which cards to be processed are placed.

Card stacker: The part of a card processing machine into which cards enter after they are processed.

Code: A short representation of a numerical information or instruction.

Coding: Assigning of letters, digits to identify or classify data.

Column indicator: A device which indicates the next column to be punched.

Common language: Code language or instruction which machines can "interpret."

Corner cut: A diagonal cut at one corner of a punched card. A deck of cards uses this corner cut to ensure that the cards are all of the same size.

Data processing: The basic functions of recording, classifying, sorting, and transmitting information.

Duplication: The automatic punching of one card into the next, normally by a card punch.

Field: One or more columns reserved for the recording of data of a specific type.

File: A collection of related records on a unit. When processing punched cards, a deck of cards related to the same record.

Glossary

at the bottom of the program drum
the drum into the socket of the

field which contains letters

eric) field: A field which can
bination of valid characters
s, special characters, spaces).

ssing: A process where data are
minimum of human intervention.
ends on recording original
such a way that further use can
without later rerecording.

ss in which work is done with a
al effort, usually including
lf-control.

the 80 vertical divisions of a
accommodating one letter, digit,
acter.

rt of a card processing machine
s to be processed are placed.

part of a card processing machine
s enter after they are processed.

Code: A short representation of alphabetic or
numerical information or instructions.

Coding: Assigning of letters, digits, or both to
identify or classify data.

Column indicator: A device which shows the
next column to be punched.

Common language: Code language or media that various
machines can "interpret."

Corner cut: A diagonal cut at one of the two upper
corners of a punched card. A person handling
a deck of cards uses this corner cut to make
sure that the cards are all facing the same way.

Data processing: The basic functions of the office:
recording, classifying, sorting, manipulating,
and transmitting information.

Duplication: The automatic punching of data from
one card into the next, normally performed on
a card punch.

Field: One or more columns reserved for the
recording of data of a specific nature.

File: A collection of related records treated as
a unit. When processing punched cards, a
deck of cards related to the same job is a file.

Flowchart: A graphical representation of a sequence of operations, using a set of conventional symbols.

Grouping: The classifying or bringing together of related records by a sorting machine.

Hardware: The mechanical, magnetic, electric, and electronic devices used for processing data.

Input: Information which enters a machine for the purpose of being processed or to aid in processing.

Interpreting: Printing on a card data that have been punched into it.

Machine code: A code that a machine can "interpret."

Magnetic disk: An input/output device and storage media. The circular disk is coated with a substance that is capable of being magnetized. Data are recorded as magnetic spots on tracks on the disk.

Magnetic tape: An input/output device and storage media. A mylar strip of tape is coated on one side with a substance that can be magnetized. The data are recorded as magnetic spots along the length of tape.

Merging: Interfiling in sequence two sets of cards.

9-edge: The bottom edge of the card parallel with the "nine" punching positions.

Output: The results produced by a data processing system, usually in the form of magnetic tape, magnetic disk, punched cards, or documents.

Program card: A card which instructs a machine to perform certain operations.

Program drum: A cylindrical drum on which a program card is fastened.

Program unit: The complete mechanism which holds the program card in place.

Punching position: One of the 12 positions in a column into which a hole may be punched.

Punching station: The place on a card where holes are punched into the card.

Reading station: The place on a card where the holes punched into the card are read.

Record: A collection of related processing punched cards, a magnetic disk, or a tape record.

Recording media: Punched cards, magnetic disk or other media on which data are recorded to be used as input to a processing system.

Record format: A layout that shows the logical and physical characteristics of a record.

Reproducing: Punching data automatically from a set of cards into another set of cards.

Selecting: The process of extracting from a set of cards only those that contain desired data.

Sequencing: The process of arranging data in alphabetic or numeric order.

cal representation of a sequence using a set of conventional

ifying or bringing together of by a sorting machine.

nical, magnetic, electric, and ces used for processing data.

which enters a machine for the g processed or to aid in

ing on a card data that have been

e that a machine can "interpret."

input/output device and storage ular disk is coated with a is capable of being magnetized. ed as magnetic spots on tracks

input/output device and storage strip of tape is coated on one stance that can be magnetized. corded as magnetic spots along ape.

g in sequence two sets of cards.

edge of the card parallel with ning positions.

produced by a data processing in the form of magnetic tape, punched cards, or documents.

Program card: A card which instructs a card punch machine to perform certain automatic functions.

Program drum: A cylindrical drum upon which the program card is fastened.

Program unit: The complete mechanism on the card punch which holds the program drum.

Punching position: One of the 12 divisions of a card column into which a hole may be punched.

Punching station: The place on a card punch where holes are punched into the card.

Reading station: The place on a card punch where the holes punched into the card may be read.

Record: A collection of related fields. When processing punched cards, a single card is a record.

Recording media: Punched cards, magnetic tape, magnetic disk or other materials onto which data are recorded to be used as input to a data processing system.

Record format: A layout that shows the arrangement and physical characteristics of the fields in a record.

Reproducing: Punching data automatically from one set of cards into another set of cards.

Selecting: The process of extracting from a stack of cards only those that contain certain desired data.

Sequencing: The process of arranging cards in either alphabetic or numeric order.

Software: Aids supplied by manufacturers to assist the user in efficient operation of electronic computer equipment.

Sorter: A machine that arranges or classifies punched cards according to a definite plan.

Source document: The original paper on which are recorded the details of a transaction.

Summary punching: The automatic process of punching one card containing data summarized from a group of cards.

Tabulating machine: A machine used for the printing of data recorded on punched cards. It is also called an accounting machine.

12-edge: The top edge of a punch

Verification: The process of checking of data which is recorded.

Verifier: A machine which is used to check the accuracy of recorded data.

Unit record: A record in which are entered each item in a transaction on one card.

Zone punch: One of the top three punches in a card column (12, 11 or 10)

led by manufacturers to assist
cient operation of electronic
t.

at arranges or classifies
ording to a definite plan.

original paper on which are
ills of a transaction.

automatic process of punching
ng data summarized from a

A machine used for the printing
on punched cards. It is also
ing machine.

12-edge: The top edge of a punch card.

Verification: The process of checking the accuracy
of data which is recorded.

Verifier: A machine which is used to check the
accuracy of recorded data.

Unit record: A record in which all the data concern-
ing each item in a transaction are punched into
one card.

Zone punch: One of the top three punching positions
in a card column (12, 11 or X, and 0).

Bibliography

TEXTBOOKS

- (A) Bux, W. E. *Key-punch training course*;
3d ed. New Rochelle, N.Y.
South-Western Publishing Co. 1975.
- (B) Cashman, T. J. & Keys W. J. *Data processing*;
2d ed. New York, N.Y. McGraw-Hill Book
Co. 1974.
- (C) Crawford, F. R. *Introduction to data processing*.
Englewood Cliffs, N.J. Prentice-Hall, Inc.
1968.
- (D) Hanson, P. L. *Key punching*; 2d ed. Englewood
Cliffs, N.J. Prentice-Hall, Inc. 1970.
- (E) International Business Machines. *Card punch
practice exercises*. New York, N.Y. The
Corporation. 1970.
- (F) Walsh, J. E. & others. *Principles of data
processing*. New York, N.Y. Pitman
Publishing Corp. 1968.
- (G) Wanous S. J., Wanous, E. E., & Wagner, G. E.
Fundamentals of data processing. New Rochelle,
N.Y. South-Western Publishing Co. 1971.
- (H) _____ *Introductory data processing*; 2d ed. New
Rochelle, N.Y. South-Western Publishing Co.
1973.

REFERENCE BOOKS

- Cashman, T. J. & Keys, W. J.
in data processing. Fullerton
Araheim Publishing Co. 1975.
- Clow, Cletus & others. *Punch
processing system*; 2d ed.
McGraw-Hill Book Co. 1975.
- International Business Machines
IBM punched card data processing
The Corporation. 1971.
- Keys, W. J. & Cashman, T. J.
data processing. New York
Book Co. 1968.
- _____ & Powell, C.H. *Handbook
operations*. San Francisco,
Press. 1970.
- Pactor, Paul & Kargillis, George
machine operation, book 1.
McGraw-Hill Book Co. 1968.
- _____ *Card-punch machine operation*
New York, N.Y. McGraw-Hill
Book Co. 1971.
- Prosser, W. R. & Beldecos, H.
projects. Baltimore, Md.
1971.

Bibliography

REFERENCE BOOKS

unch training course;
chelle, N.Y.
Publishing Co. 1975.

Keys W. J. *Data processing*;
rk, N.Y. McGraw-Hill Book

Introduction to data processing.
fs, N.J. Prentice-Hall, Inc.

keypunching; 2d ed. Englewood
Prentice-Hall, Inc. 1970.

Business Machines. *Card punch*
ises. New York, N.Y. The
1970.

thers. *Principles of data*
ew York, N.Y. Pitman
p. 1968.

nous, E. E., & Wagner, G. E.
f data processing. New Rochelle,
stern Publishing Co. 1971.

y data processing; 2d ed. New
South-Western Publishing Co.

Cashman, T. J. & Keys, W. J. *Practice projects*
in data processing. Fullerton, Calif.
Araheim Publishing Co. 1970.

Clow, Cletus & others. *Punched-card data*
processing system; 2d ed. New York, N.Y.
McGraw-Hill Book Co. 1975.

International Business Machines. *Introduction to*
IBM punched card data processing. New York, N.Y.
The Corporation. 1971.

Keys, W. J. & Cashman, T. J. *Basic principles of*
data processing. New York, N.Y. McGraw-Hill
Book Co. 1968.

_____ & Powell, C.H. *Handbook of modern keypunch*
operations. San Francisco, Calif. Canfield
Press. 1970.

Pactor, Paul & Kargillis, George. *Card-punch*
machine operation, book 1. New York, N.Y.
McGraw-Hill Book Co. 1968.

_____ *Card-punch machine operation*, book 2.
New York, N.Y. McGraw-Hill Book Co. 1973.

Prosser, W. R. & Beldecos, H.J. *Keypunch*
projects. Baltimore, Md. H. M. Rowe Co. 1971.

Science Research Associates Inc. *Principles of business data processing*; 2d ed. Chicago, Ill. The Corporation. 1974.

Van Ness, R. G. *Principles of punched card data processing*; rev ed. New York, N.Y. Business Press. 1967.

Wanous, S. J., Wanous, E. E., & Hughes, A. E. *Introduction to automated data processing*. New Rochelle, N.Y. South-Western Publishing Co. 1975.

FILMS

Data processing: introduction. Coronet. 1972. 14 min. sound. color. Purchase - Coronet Films. Rent - Syracuse Films.

Data processing: introductory principles. Sterling. 14 min. sound. color. Purchase - Sterling Educational Films. Rent - Business Education Films.

Printing card punch. Sterling. 13 min. sound. color. Purchase - Sterling Educational Films. Rent - Business Education Films.

Programming the keypunch. Sterling. 13 min. sound. color. Purchase - Sterling Educational Films. Rent - Business Education Films.

TRANSPARENCIES

Alphabetic sorting. United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

Basic punched card operations. Inc. one transparency. Purchase - Transparencies, Inc.

Card fields. United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

Data processing system. United Transparencies, Inc. two transparencies. Purchase - United Transparencies, Inc.

Numeric sorting. United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

PROGRAMED INSTRUCTIONAL UNITS

Card punch drills for Dart Systems. Associates, Inc. four exercises. Purchase - Cardinal Associates, Inc.

IBM Printing card punch series. Cardinal Associates, Inc. 12 units. Purchase - Cardinal Associates, Inc.

Associates Inc. *Principles of processing*; 2d ed. Chicago, Ill. 1974.

Principles of punched card data processing. New York, N.Y. 1967.

W. E. Hughes, E. E., & Hughes, A. E. *Automated data processing*. New York, N.Y. South-Western Publishing

Introduction. Coronet. 1972. color. Purchase - Coronet
Syracuse Films.

Introductory principles. in. sound. color. Purchase - National Films. Rent - Business

Ph. Sterling. 13 min. sound. e - Sterling Educational
Business Education Films.

Typing. Sterling. 13 min. Purchase - Sterling
ms. Rent - Business Education

g. United Transparencies, Inc.
y. Purchase - United Transparencies,

Basic punched card operations. United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

Card fields. United Transparencies, Inc. one transparency. Purchase - United Transparencies, Inc.

Data processing system. United Transparencies, Inc. two transparencies. Purchase - United Transparencies, Inc.

Numeric sorting. United Transparencies, Inc., one transparency. Purchase - United Transparencies, Inc.

PROGRAMED INSTRUCTIONAL UNITS

Card punch drills for Dart System. Cardinal Associates, Inc. four exercises. Purchase - Cardinal Associates, Inc.

IBM Printing card punch series for Dart System. Cardinal Associates, Inc. 12 lessons. Purchase - Cardinal Associates, Inc.